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Field Tests of Industrial Stoker Coal-Fired Boilers for Emissions Control and Efficiency Improvement--Site F

KVB Inc.
Minneapolis, MN

Prepared for

Industrial Environmental Research Lab.
Research Triangle Park, NC

Apr 80

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Field Tests of Industrial Stoker Coal-fired Boilers for Emissions Control and Efficiency Improvement — Site F

(Data Supplement)

by

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6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

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Project Officers: R. Hall (EPA) and W. Harvey, Jr. (DoE)

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Research Triangle Park, NC 27711

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The Data Supplement is a compilation of test data presented in greater detail than was practical in the final technical report. It is intended to provide the necessary details to other researchers who are interested in performing their own analysis. Readers are referred to the contract final report for information as to objectives, description of facility tested and coals fired, test equipment and procedures, interpretations, and conclusions. The final technical report also contains data summaries not found in this Supplement. The Supplement contains panel board data for each test, detailed particulate, O2, CO2, NO, SO2, and SO3 data, particle size distribution data, chemical analysis of the coal, and coal size consistency data.

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Boilers	Efficiency	Stationary Sources	13A	
Combustion	Flue Gases	Combustion Modification	21B	
Coal	Fly Ash	Spreader Stokers	21D	
Field Tests	Particle Size	Particulate	14B	
Dust	Nitrogen Oxides	Overfire Air	11G	07B
Stokers	Sulfur Oxides	Flyash Reinjection		

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FOREWORD

The purpose of this Data Supplement Volume is to document data in greater detail than was practical in the Final Technical Report.[1] It is intended to provide the necessary details to other researchers who are interested in performing their own analysis. Readers are referred to the contract final report for information as to objectives, description of facility tested and coals fired, test equipment and procedures, interpretations and conclusions. The Final Technical Report also contains data summaries not found in this volume.

The data in this volume are arranged by type (i.e., Panel Board Data, Particulate Data, etc.) and within each type by test number. Data summaries where they exist are at the front of each section. The boiler tested is referred to as Boiler F; as it is the sixth boiler tested under the program entitled, "A Testing Program to Update Equipment Specifications and Design Criteria for Stoker Fired Boilers."

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[1] Gabrielson, J. E., et al., "Field Tests of Industrial Stoker Coal-Fired Boilers for Emissions Control and Efficiency Improvement - Site F."

CONVERSION FACTORS

ENGLISH AND METRIC UNITS TO SI UNITS

To Convert From	To	Multiply By
in	cm	2.540
in^2	cm^2	6.452
ft	m	0.3048
ft^2	m^2	0.09290
ft^3	m^3	0.02832
lb	Kg	0.4536
lb/hr	Mg/s	0.1260
$lb/10^6BTU$	ng/J	430
g/Mcal	ng/J	239
BTU	J	1054
BTU/lb	J/kg	2324
BTU/hr	W	0.2929
J/sec	W	1.000
J/hr	W	3600
BTU/ft/hr	W/m	0.9609
BTU/ft/hr	J/hr/m	3459
$BTU/ft^2/hr$	W/m^2	3.152
$BTU/ft^2/hr$	$J/hr/m^2$	11349
$BTU/ft^3/hr$	W/m^3	10.34
$BTU/ft^3/hr$	$J/hr/m^3$	37234
psia	Pa	6895
"H_2O	Pa	249.1
Rankine	Celsius	C = 5/9R-273
Fahrenheit	Celsius	C = 5/9(F-32)
Celsius	Kelvin	K = C+273
Rankine	Kelvin	K = 5/9R

FOR TYPICAL COAL FUEL

ppm @ 3% O_2 (SO_2)	ng/J ($lb/10^6Btu$)	0.851 (1.98×10^{-3})
ppm @ 3% O_2 (SO_3)	ng/J ($lb/10^6Btu$)	1.063 (2.47×10^{-3})
ppm @ 3% O_2 (NO)*	ng/J ($lb/10^6Btu$)	0.399 (9.28×10^{-4})
ppm @ 3% O_2 (NO_2)	ng/J ($lb/10^6Btu$)	0.611 (1.42×10^{-3})
ppm @ 3% O_2 (CO)	ng/J ($lb/10^6Btu$)	0.372 (8.65×10^{-4})
ppm @ 3% O_2 (CH_4)	ng/J ($lb/10^6Btu$)	0.213 (4.95×10^{-4})

*Federal environmental regulations express NOx in terms of NO_2; thus NO units should be converted using the NO_2 conversion factor.

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CONVERSION FACTORS

SI UNITS TO ENGLISH AND METRIC UNITS

To Convert From	To	Multiply By
cm	in	0.3937
cm^2	in^2	0.1550
m	ft	3.281
m^2	ft^2	10.764
m^3	ft^3	35.315
Kg	lb	2.205
Mg/s	lb/hr	7.937
ng/J	lb/10^{6}BTU	0.00233
ng/J	g/Mcal	0.00418
J	BTU	0.000948
J/kg	BTU/lb	0.000430
J/hr/m	BTU/ft/hr	0.000289
J/hr/m^2	BTU/ft^2/hr	0.0000881
J/hr/m^3	BTU/ft^3/hr	0.0000269
W	BTU/hr	3.414
W	J/hr	0.000278
W/m	BTU/ft/hr	1.041
W/m^2	BTU/ft^2/hr	0.317
W/m^3	BTU/ft^3/hr	0.0967
Pa	psia	0.000145
Pa	"H_2O	0.004014
Kelvin	Fahrenheit	F = 1.8K-460
Celsius	Fahrenheit	F = 1.8C+32
Fahrenheit	Rankine	R = F+460
Kelvin	Rankine	R = 1.8K

FOR TYPICAL COAL FUEL

ng/J	ppm @ 3% O_2 (SO_2)	1.18
ng/J	ppm @ 3% O_2 (SO_3)	0.941
ng/J	ppm @ 3% O_2 (NO)	2.51
ng/J	ppm @ 3% O_2 (NO_2)	1.64
ng/J	ppm @ 3% O_2 (CO)	2.69
ng/J	ppm @ 3% O_2 (CH_4)	4.69

SI PREFIXES

Multiplication Factor	Prefix	SI Symbol
10^{18}	exa	E
10^{15}	peta	P
10^{12}	tera	T
10^{9}	giga	G
10^{6}	mega	M
10^{3}	kilo	k
10^{2}	hecto*	h
10^{1}	deka*	da
10^{-1}	deci*	d
10^{-2}	centi*	c
10^{-3}	milli	m
10^{-6}	micro	μ
10^{-9}	nano	n
10^{-12}	pico	p
10^{-15}	femto	f
10^{-18}	atto	a

*Not recommended but occasionally used

EMISSION UNITS CONVERSION FACTORS FOR TYPICAL COAL FUEL (HV = 13,320 BTU/LB)

To Obtain \ Multiply By		% Weight in Fuel		lbs/10^6Btu		grams/10^6Cal		PPM (Dry @ 3% O_2)		Grains/SCF. (Dry @ 12% CO_2)	
		S	N	SO_2	NO_2	SO_2	NO_2	SOx	NOx	SO_2	NO_2
% Weight In Fuel	S	1		0.666		0.370		13.2×10^{-4}		1.48	
	N				0.405		0.225		5.76×10^{-4}		.903
lbs/10^6Btu	SO_2	1.50		1		(.556)		19.8×10^{-4}		(2.23)	
	NO_2		2.47				(.556)		14.2×10^{-4}		(2.23)
grams/10^6Cal	SO_2	2.70		(1.8)		1		35.6×10^{-4}		(4.01)	
	NO_2		4.44		(1.8)				25.6×10^{-4}		(4.01)
PPM (Dry @ 3% O_2)	SOx	758		505		281		1		1127	
	NOx		1736		704		391				1566
Grains/SCF (Dry @ 12% CO_2)	SO_2	.676		(.448)		(.249)		8.87×10^{-4}		1	
	NO_2		1.11		(.448)		(.249)		6.39×10^{-4}		

NOTE: 1. Values in parenthesis can be used for all flue gas constituents such as oxides of carbon, oxides of nitrogen, oxides of sulfur, hydrocarbons, particulates, etc.
2. Standard reference temperature of 530°R was used.

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SECTION 1.0

PANEL BOARD DATA

1.1 CONTROL ROOM DATA SHEETS PAGE 2

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 5340

Steam Flow, lb/hr 60029

FW Flow, lb/hr (avg from chart readings) 62 250

% Design Capacity 75.0

Evaporation 11.24 lb steam/lb coal

DESIGN CAP. = 80,000 lb/h steam @ 150 psig O_2 variation @ ~60K lb/Hr.

TEST NUMBER	1	2	3	4	
DATE	12-18-78	12-18-78	12-18-78	12-18-78	
DESCRIPTION	Baseline	Hi O_2	Hi O_2	Lo O_2	
Coal Designation	Pennsylvania medium volatile bituminous coal			→	
INTEGRATORS					
Coal Scale x 200 lbs	85243	85318	85356	85429	
Time of Reading	10:02	12:49	14:14	17:00	
Steam Flow x 100 lbs	2235422	2237128	2237975	2239604	
Feedwater Flow x 100 lbs	747195	747195	O.O.S.	O.O.S.	
Time of Reading	10:03	12:50	14:15	17:01	
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+2.4	+3.4	+3.9	+1.6	
Windbox Pressure, "H_2O	+1.2	+1.3	+1.5	+0.8	
Furnace Pressure, "H_2O	-.2	-.2	-0.2	-0.15	
Boiler Outlet Pressure, "H_2O	-.9	-1.1	-1.4	-0.8	
Economizer Outlet Pressure, "H_2O	-2.8	-3.2	-3.7	-2.2	
Dust Collector Outlet Pressure, "H_2O	-6.1	-7.4	-8.3	-4.7	
PRESSURE GAUGES					
Boiler Steam Pressure, psig	147	145	145	142	
Steam Header Pressure, psig	147	145	143	140	
Feedwater Header Pressure, psig	199	195	192	185	

Sheet 2 of 4

KVB

TEST NUMBER	1	2	3	4	
-					
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	63.0	61.5	61.0	61.5	
Air Flow, %	61.0	70.0	81.0	50.0	
Excess Oxygen, %	7.5	8.8	9.5	6.8	
Economizer Gas Temp Inlet, °F	548	550	552	527	
Economizer FW Temp Outlet, °F	312	318	330	300	
Economizer Gas Temp Outlet, °F	377	376	387	360	
Feedwater Flow x 1000 lb/hr	64.0	63.0	55.0	67.0	
Steam Pressure, psig	145	145	142	139	
Feedwater Temp, °F	222	222	219	218	
Feedwater Header Press, psig	197	190	188	182	
Opacity, % 0 ÷ 100	8	8	8	8	
CONTROLS					
Boiler Master/Stoker	60	57	57	43	
Fuel Air Ratio	52	51	52	52	
Forced Draft	62	71	78	54	
Furnace Draft	60	66	72	50	
Furnace Draft Bias	-.2	-.2	-0.2	-0.2	
Economizer By-Pass	0	0	0	0	
Feedwater Flow	64	63	66	69	
Condensate Flow	50	50	50	50	
Feedwater Pressure	0	0	0	0	

Sheet 3 of 4

KVB

TEST NUMBER	1	2	3	4	
STOKER					
Front Upper OFA Press, "H_2O	.46 12.7	.46 12.7	.47 13.0	.48 14.3	
Front Lower OFA Press, "H_2O	10.2	.31 8.6	.31 8.6	.31 8.6	
Rear Upper OFA Press, "H_2O	1.4	.06 1.7	.06 1.7	06 1.7	
Rear Lower OFA Press, "H_2O	6.9	.17 4.7	.23 6.4	.23 6.4	
Boiler Hopper Reinjection Pressure, "H_2O	6.1	.23 6.4	.23 6.4	.23 6.4	
Econ Hopper Reinjection Pressure, "H_2O	8.6	.31 8.6	.31 8.6	.32 8.9	
Overfire Air Fan Static Pressure, "H_2O	34.6	1.28 35.4	1.20 33.2	1.21 33.5	
Boiler Hopper Reinjection, YES/NO	yes	yes	Yes	Yes	
Economizer Hopper Reinjection, YES/NO	yes	yes	Yes	Yes	
FURNACE					
Ash Bed Thickness, inches	~ 3	~ 3	~ 3	~ 2	
Clinker Formation, YES/NO	No	No	No	NO	
Visible Smoke?	No	No	No	NO	

Sheet 4 of 4

NOTES

TEST NO: 4

Control Room O_2 at ≈ 2% unit opacity meter read ≈ 50%

TEST NO:

TEST NO:

TEST NO:

TEST NO:

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr —
Steam Flow, lb/hr (from chart) 43000
FW Flow, lb/hr (from chart) 45000
% Design Capacity 53.8
Evaporation —

TEST NUMBER	5	5			
DATE	12-19-78	12-19-78			
DESCRIPTION	Baseline Partic. Test	→			
	Pennsylv. Coal	Pennsylv. Coal			
INTEGRATORS		Unit changed load at 17:30 could not get second data point			
Coal Scale x 200 lbs	85838				
Time of Reading	1010				
Steam Flow x 100 lbs	2249027				
Feedwater Flow x 100 lbs	O.O.S.				
Time of Reading	1009				
DRAFT GAUGES					
FD Fan Pressure, "H_2O	1.25				
Windbox Pressure, "H_2O	.8				
Furnace Pressure, "H_2O	-.175				
Boiler Outlet Pressure, "H_2O	-.7				
Economizer Outlet Pressure, "H_2O	-2.0				
Dust Collector Outlet Pressure, "H_2O	-4.1				
PRESSURE GAUGES					
Boiler Steam Pressure, psig	136				
Steam Header Pressure, psig	136				
Feedwater Header Pressure, psig	192				

Sheet 2 of 4

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TEST NUMBER	5				
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	46.0				
Air Flow, %	43.5				
Excess Oxygen, %	8.6				
Economizer Gas Temp Inlet, °F	494				
Economizer FW Temp Outlet, °F	345				
Economizer Gas Temp Outlet, °F	308				
Feedwater Flow x 1000 lb/hr	45.0				
Steam Pressure, psig	136				
Feedwater Temp, °F	222				
Feedwater Header Press, psig	190				
Opacity, %	8				
CONTROLS					
Boiler Master/Stoker	40				
Fuel Air Ratio	52				
Forced Draft	52				
Furnace Draft	47				
Furnace Draft Bias	-.25				
Economizer By-Pass	0				
Feedwater Flow	52				
Condensate Flow	53				
Feedwater Pressure	0				

Sheet 3 of 4

TEST NUMBER	5				
--					
STOKER					
Front Upper OFA Press, "H_2O	.48 psig 13.3				
Front Lower OFA Press, "H_2O	.36 10.0				
Rear Upper OFA Press, "H_2O	.06 1.7				
Rear Lower OFA Press, "H_2O	.22 6.1				
Boiler Hopper Reinjection Pressure, "H_2O	.24 6.6				
Econ Hopper Reinjection Pressure, "H_2O	.31 8.6				
Overfire Air Fan Static Pressure, "H_2O	1.3 36.0				
Boiler Hopper Reinjection, YES/NO	yes				
Economizer Hopper Reinjection, YES/NO	yes				
FURNACE					
Ash Bed Thickness, inches	2.5 - 3				
Clinker Formation, YES/NO	No				
Visible Smoke?	No				

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 3611

Steam Flow, lb/hr 42300

FW Flow, lb/hr 39000
(avg. from chart)

% Design Capacity 52.9

Evaporation 11.71 lb steam / lb coal

TEST NUMBER	6	6	7	8	9
DATE	12-20-78	12-20-78	12-20-78	12-20-78	12-20-78
DESCRIPTION	BASELINE	BASELINE	MED-HI O_2	LO O_2	HI O_2
INTEGRATORS					
Coal Scale x 200 lbs	86385	86404	86436	86469	86487
Time of Reading	10:25	11:29	13:16	15:06	16:04
Steam Flow x 100 lbs	2261568	2262023	2262787	2263540	2263965
Feedwater Flow x 100 lbs	0.0.S.	0.0.S	0.0.S.	0.0.S	0.0.S.
Time of Reading	10:26	11:31	13:18	15:07	16:06
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+0.6	+0.6	+1.2	+0.3	+2.2
Windbox Pressure, "H_2O	+0.4	+0.4	+0.6	+0.2	+1.1
Furnace Pressure, "H_2O	-0.15	-0.15	-0.18	-0.15	-0.16
Boiler Outlet Pressure, "H_2O	-0.55	-0.55	-0.65	-0.48	-0.80
Economizer Outlet Pressure, "H_2O	-1.50	-1.50	-1.97	-1.23	-2.50
Dust Collector Outlet Pressure, "H_2O	-3.2	-3.1	-4.1	-2.5	-5.6
PRESSURE GAUGES					
Boiler Steam Pressure, psig	145	145	140	145	144
Steam Header Pressure, psig	145	145	140	145	144
Feedwater Header Pressure, psig	210	202	225	212	211

Sheet 2 of 4

KVB

TEST NUMBER	6	6	7	8	9
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	43.0	42.0	42.0	43.0	42.2
Air Flow, %	35.0	34.8	42.0	29.0	59.0
Excess Oxygen, %	8.3	8.1	9.8	6.8	11.8
Economizer Gas Temp Inlet, °F	480	480	486	469	500
Economizer FW Temp Outlet, °F	305	303	312	300	330
Economizer Gas Temp Outlet, °F	340	338	339	330	350
Feedwater Flow x 1000 lb/hr	45	36	34	43	36
Steam Pressure, psig	141	140	135	140	140
Feedwater Temp, °F	219	220	219	225	225
Feedwater Header Press, psig	200	198	190	205	204
Opacity, %	2.2	2.2	2.3	2.2	2.2
CONTROLS					
Boiler Master/Stoker	35	35	35	38	38
Fuel Air Ratio	42	42	50	33	67
Forced Draft	44	47	50	25	62
Furnace Draft	35	40	45	2	58
Furnace Draft Bias	-0.18	-0.18	-0.20	-0.20	-0.15
Economizer By-Pass	0	0	0	0	0
Feedwater Flow	54	54	57	52	50
Condensate Flow	43	43	43	43	43
Feedwater Pressure	0	0	0	51	49

Sheet 3 of 4

KVB

TEST NUMBER	6	6	7	8	9
STOKER					
Front Upper OFA Press, "H_2O	0.48psig 13.3	0.48 13.3	0.48 13.3	.49 13.6	.47 13.0
Front Lower OFA Press, "H_2O	0.35 9.7	0.33 9.1	0.31 8.6	.31 8.6	.31 8.6
Rear Upper OFA Press, "H_2O	.06 1.7	.06 1.7	.06 1.7	.06 1.7	.06 1.7
Rear Lower OFA Press, "H_2O	0.23 6.4	0.21 5.8	.20 5.5	.23 6.4	.19 5.3
Boiler Hopper Reinjection Pressure, "H_2O	0.24 6.6	0.25 6.9	.24 6.6	.23 6.4	.24 6.6
Econ Hopper Reinjection Pressure, "H_2O	0.32 8.9	0.35 9.7	.32 8.9	.31 8.6	.35 9.7
Overfire Air Fan Static Pressure, "H_2O	1.24 34.3	1.29 35.4	1.26 34.9	1.24 34.3	1.24 34.3
Boiler Hopper Reinjection, YES/NO	Yes	Yes	Yes	Yes	Yes
Economizer Hopper Reinjection, YES/NO	Yes	Yes	Yes	Yes	Yes
FURNACE					
Ash Bed Thickness, inches	2½"	2½"	2"	2½"	3"
Clinker Formation, YES/NO	NO	NO	NO	NO	NO
Visible Smoke?	NO	NO	NO	NO	NO

27.68

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7298.5
Steam Flow, lb/hr 78133.8
FW Flow, lb/hr —
% Design Capacity 97.7
Evaporation 10.7 lb steam/lb coal

TEST NUMBER	10	10	10		
DATE	1-4-79	1-4-79	1-4-79		
DESCRIPTION	BASELINE	BASELINE	BASELINE		
INTEGRATORS					
Coal Scale x 200 lbs	094409	094548	094572		
Time of Reading	11:06	14:54	15:34		
Steam Flow x 100 lbs	2441351	2444316	2444854		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.		
Time of Reading	11:08	14:55	15:37		
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+4.4	+4.4	+4.3		
Windbox Pressure, "H_2O	+1.7	+1.7	+1.6		
Furnace Pressure, "H_2O	-0.25*	-0.23	-0.23		
Boiler Outlet Pressure, "H_2O	-1.45	-1.40	-1.35		
Economizer Outlet Pressure, "H_2O	-4.2	-4.2	-4.1		
Dust Collector Outlet Pressure, "H_2O	-9.5	-9.3	-9.2		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	150	149	150		
Steam Header Pressure, psig	145	145	148		
Feedwater Header Pressure, psig	200	197	231		
* should read ~0.20					

Sheet 2 of 4

KVB

TEST NUMBER	10	10	10		
-					
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	80.0	79.0	79.0		
Air Flow, %	84.0	84.0	84.0		
Excess Oxygen, %	7.0	7.1	7.4		
Economizer Gas Temp Inlet, °F	588	583	585		
Economizer FW Temp Outlet, °F	320	320	320		
Economizer Gas Temp Outlet, °F	402	400	400		
Feedwater Flow x 1000 lb/hr	71	81	63		
Steam Pressure, psig	141	142	145		
Feedwater Temp, °F	220	220	226		
Feedwater Header Press, psig	190	192	205		
Opacity, %	2.5	2.5	2.5		
CONTROLS					
Boiler Master/Stoker	69	70	70		
Fuel Air Ratio	58	58	58		
Forced Draft	81	80	80		
Furnace Draft	89	87	88		
Furnace Draft Bias	-0.20	-0.20	-0.20		
Economizer By-Pass	0	0	0		
Feedwater Flow	76	74	75		
Condensate Flow	34	34	34		
Feedwater Pressure	42	41	0		

Sheet 3 of 4

KVB

TEST NUMBER	10	10	10		
STOKER	psi ↓				
Front Upper OFA Press, "H_2O	(.53) 14.7	.50 13.8	.50 13.8		
Front Lower OFA Press, "H_2O	(.35) 9.7	.36 10.0	.34 9.4		
Rear Upper OFA Press, "H_2O	(.05) 1.4	.05 1.4	.05 1.4		
Rear Lower OFA Press, "H_2O	(.24) 6.6	.22 6.1	.23 6.4		
Boiler Hopper Reinjection Pressure, "H_2O	(.24) 6.6	.24 6.6	.24 6.6		
Econ Hopper Reinjection Pressure, "H_2O	(.32) 8.9	.32 8.9	.32 8.9		
Overfire Air Fan Static Pressure, "H_2O	(1.26) 34.9	1.30 36.0	1.25 34.6		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
FURNACE					
Ash Bed Thickness, inches	3	3	3½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

KVB

NOTES

TEST NO: 10	
Test had to be stopped when boiler load could not be held due to warming ambient air.	
TEST NO:	
TEST NO:	
TEST NO:	
TEST NO:	

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7403.0

Steam Flow, lb/hr 79290

FW Flow, lb/hr —

% Design Capacity 99.1

Evaporation 10.7

TEST NUMBER	11	12	13	14	
DATE	1-5-79	1-5-79	1-5-79	1-5-79	
DESCRIPTION	O_2 VARIATIONS BASELINE	Hi O_2	Lo O_2	Med O_2	
INTEGRATORS					
Coal Scale x 200 lbs	0951[illegible]	095154	095184	095226	
Time of Reading	10:57	12:21	13:10	14:18	
Steam Flow x 100 lbs	2456296	2457391	2458039	2458939	
Feedwater Flow x 100 lbs	0.O.S.	0.O.S.	0.O.S.	0.O.S	
Time of Reading	10:59	12:23	13:11	14:19	
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+4.4	+5.0	+2.8	+3.4	
Windbox Pressure, "H_2O	+1.7	+2.0	+1.2	+1.4	
Furnace Pressure, "H_2O	-0.25	-0.18	-0.19	-0.20	
Boiler Outlet Pressure, "H_2O	-1.45	-1.35	-1.00	-1.10	
Economizer Outlet Pressure, "H_2O	-4.2	-4.2	-3.0	-3.3	
Dust Collector Outlet Pressure, "H_2O	-9.5	-9.5	-6.7	-7.3	
PRESSURE GAUGES					
Boiler Steam Pressure, psig	148	145	153	143	
Steam Header Pressure, psig	144	140	149	140	
Feedwater Header Pressure, psig	193	207	211	200	

TEST NUMBER	11	12	13	14	
-					
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	81.5	80.0	80.5	81.0	
Air Flow, %	84.5	92.5	68.0	74.0	
Excess Oxygen, %	7.3	7.5	5.2	6.2	
Economizer Gas Temp Inlet, °F	590	585	570	572	
Economizer FW Temp Outlet, °F	320	320	310	300	
Economizer Gas Temp Outlet, °F	402	402	390	393	
Feedwater Flow x 1000 lb/hr	80	78	82	67	
Steam Pressure, psig	139	135	145	134	
Feedwater Temp, °F	220	220	220	220	
Feedwater Header Press, psig	185	197	206	190	
Opacity, %	2.5	2.5	2.5	2.5	
F.D. FAN INLET AIR TEMP, °F	77	78	78	78	
CONTROLS					
Boiler Master/Stoker	72	72	71	68	
Fuel Air Ratio	53	53	53	53	
Forced Draft	81	95	60	66	
Furnace Draft	89	100	70	74	
Furnace Draft Bias	-0.20	-0.10	-0.17	-0.15	
Economizer By-Pass	0	0	0	0	
Feedwater Flow	84	74	76	76	
Condensate Flow	34	34	34	34	
Feedwater Pressure	44	59	100	49	

Sheet 3 of 4

TEST NUMBER	11	12	13	14	
--					
STOKER					
Front Upper OFA Press, "H_2O	.51 14.1	.51 14.1	.49 13.6	.50	
Front Lower OFA Press, "H_2O	.36 10.0	.34 9.4	.37 10.2	.37 10.2	
Rear Upper OFA Press, "H_2O	.07 1.9	.06 1.7	.06 1.7	.05	
Rear Lower OFA Press, "H_2O	.19 5.3	.22 6.1	.22 6.1	.23 6.4	
Boiler Hopper Reinjection Pressure, "H_2O	.23 6.4	.22 6.1	.24 6.6	.24 6.6	
Econ Hopper Reinjection Pressure, "H_2O	.31 8.6	.31 8.6	.32 8.9	.32 8.9	
Overfire Air Fan Static Pressure, "H_2O	1.29 35.4	1.30 36.0	1.26 34.9	1.25	
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES	
Economizer Hopper Reinjection, YES/NO	YES	YES	YES	YES	
FURNACE					
Ash Bed Thickness, inches	3	3	3	3	
Clinker Formation, YES/NO	NO	NO	NO	NO	
Visible Smoke?	NO	NO	NO	NO	

KVB

NOTES

TEST NO: 13

AT LO O_2 HAVE SOME UNBURNED CARBON IN BOTTOM ASH. NO CLINKERS ON GRATE, BUT CLINKER IN ASH PIT,

TEST NO: 14

SLIGHT AMOUNT OF UNBURNED CARBON IN BOTTOM ASH - NOT AS MUCH (APPARENTLY) AS IN TEST #13

TEST NO:

TEST NO:

TEST NO:

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7263.2
Steam Flow, lb/hr 78973
FW Flow, lb/hr —
% Design Capacity 98.7
Evaporation 10.9

TEST NUMBER	15	15	15		
DATE	1-8-79	1-8-79	1-8-79		
DESCRIPTION	HIGH O_2 PARTICULATES	HIGH O_2 PARTICULATES	HIGH O_2 PARTICULATES		
INTEGRATORS					
Coal Scale x 200 lbs	096712	096755	096781		
Time of Reading	13:35	14:47	15:29		
Steam Flow x 100 lbs	2492366	2493250	2493827		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S	O.O.S.		
Time of Reading	13:41	14:49	15:32		
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+5.0	+4.8	+4.9		
Windbox Pressure, "H_2O	+2.0	+1.9	+1.9		
Furnace Pressure, "H_2O	-0.17	-0.18	-0.17		
Boiler Outlet Pressure, "H_2O	-1.30	-1.25	-1.27		
Economizer Outlet Pressure, "H_2O	-4.1	-4.1	-4.1		
Dust Collector Outlet Pressure, "H_2O	-9.4	-9.3	-9.3		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	144	140	141		
Steam Header Pressure, psig	140	135	136		
Feedwater Header Pressure, psig	200	195	188		

Sheet 2 of 4

KVB

TEST NUMBER	15	15	15		
-					
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	80.0	80.0	84.0		
Air Flow, %	93.5	93.0	94.0		
Excess Oxygen, %	7.3	6.8	7.0		
Economizer Gas Temp Inlet, °F	583	585	589		
Economizer FW Temp Outlet, °F	320	320	330		
Economizer Gas Temp Outlet, °F	400	400	400		
Feedwater Flow x 1000 lb/hr	67	81	80		
Steam Pressure, psig	135	129	129		
Feedwater Temp, °F	220	220	220		
Feedwater Header Press, psig	191	188	180		
Opacity, % *	2.5	3.5	2.8		
CONTROLS					
Boiler Master/Stoker	84	84	82		
Fuel Air Ratio	58	56	55		
Forced Draft	100	100	94		
Furnace Draft	100	100	100		
Furnace Draft Bias	-0.08	-0.05	-0.05		
Economizer By-Pass	0	0	0		
Feedwater Flow	76	80	90		
Condensate Flow	34	34	34		
Feedwater Pressure	100	100	86		

* At stack, downstream of precipitator

Sheet 3 of 4

KVB

TEST NUMBER	15	15	15		
STOKER					
Front Upper OFA Press, "H_2O	.49 13.6	.50 13.8	.48 13.3		
Front Lower OFA Press, "H_2O	.33 9.1	.37 10.2	.35 9.7		
Rear Upper OFA Press, "H_2O	.06 1.7	.18 2.2	.06 1.7		
Rear Lower OFA Press, "H_2O	.19 5.3	.19 5.3	.18 5.0		
Boiler Hopper Reinjection Pressure, "H_2O	.21 5.8	.23 6.4	.22 6.1		
Econ Hopper Reinjection Pressure, "H_2O	.31 8.6	.31 8.6	.31 8.6		
Overfire Air Fan Static Pressure, "H_2O	1.25 34.6	1.26 34.9	1.21 33.5		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP, °F	82	79	79		
FURNACE					
Ash Bed Thickness, inches	3	3	2½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

1/10/79		1/9/79
7059	Coal Flow, lb/hr	7200
73826	Steam Flow, lb/hr	79673
—	FW Flow, lb/hr	—
92.3	% Design Capacity	99.6
10.5	Evaporation	11.1

TEST NUMBER	16a	16a	16b	16c	16c
DATE	1-9-79	1-9-79	1-9-79	1-10-79	1-10-79
DESCRIPTION	OFA VARIATIONS BASELINE	→	MAX OFA	LOW OFA	LOW OFA
	100% LOAD	→	→	→	→
INTEGRATORS					
Coal Scale x 200 lbs	097506	097544	097572	098126	098146
Time of Reading	14:35	15:38	16:25	10:12	10:46
Steam Flow x 100 lbs	2510011	2510886	2511392	2523435	2523718
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.	O.O.S.	O.O.S
Time of Reading	14:37	15:42	16:21	10:13	10:36
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+4.4	+4.2	+4.1	+3.8	+4.8
Windbox Pressure, "H_2O	+1.7	+1.7	+1.6	+1.6	+1.8
Furnace Pressure, "H_2O	-0.20	-0.20	-0.20	-0.20	-0.23
Boiler Outlet Pressure, "H_2O	-1.30	-1.25	-1.25	-1.15	-1.35
Economizer Outlet Pressure, "H_2O	-3.9	-3.9	-3.8	-3.5	-4.2
Dust Collector Outlet Pressure, "H_2O	-8.9	-8.6	-8.6	-7.8	-9.4
PRESSURE GAUGES					
Boiler Steam Pressure, psig	139	146	146	145	145
Steam Header Pressure, psig	135	142	144	141	140
Feedwater Header Pressure, psig	195	197	197	210	186

Sheet 2 of 4

KVB

TEST NUMBER	16a	16a	16b	16c	16c
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	81.0	80.0	81.0	78.0	77.0
Air Flow, %	92.5	90.0	86.0	81.0	91.5
Excess Oxygen, %	6.6	6.8	6.8	6.5	7.0
Economizer Gas Temp Inlet, °F	580	582	588	580	590
Economizer FW Temp Outlet, °F	317	319	319	320	320
Economizer Gas Temp Outlet, °F	397	396	396	392	400
Feedwater Flow x 1000 lb/hr	79	78	76	72	72
Steam Pressure, psig	130	138	139	136	136
Feedwater Temp, °F	220	220	220	243	218
Feedwater Header Press, psig	185	188	190	180	174
Opacity, % * (in stack, dwnstm	2.5	2.5	2.5	3.6	6.0
of precipitator)					
CONTROLS					
Boiler Master/Stoker	72	71	71	81	82
Fuel Air Ratio	53	52	52	56	58
Forced Draft	80	77	74	89	83
Furnace Draft	85	85	84	91	70
Furnace Draft Bias	-0.15	-0.15	-0.17	-0.14	-0.15
Economizer By-Pass	0	0	0	0	0
Feedwater Flow	73	76	78	78	84
Condensate Flow	34	34	34	34	34
Feedwater Pressure	76	76	76	41	41

Sheet 3 of 4

KVB

TEST NUMBER	16a	16a	16b	16c	16c
STOKER	Baseline	Baseline	Max	Low	Low
Front Upper OFA Press, "H_2O	.49 13.6	.46 12.7	.40 11.1	.19 5.3	.18 5.0
Front Lower OFA Press, "H_2O	.36 10.0	.35 9.7	.36 10.0	.24 6.6	.24 6.6
Rear Upper OFA Press, "H_2O	.05 1.4	.04 1.1	.16 4.4	.10 2.8	.09 2.5
Rear Lower OFA Press, "H_2O	.19 5.3	.19 5.3	.30 8.3	.10 2.8	.10 2.8
Boiler Hopper Reinjection Pressure, "H_2O	.20 5.5	.20 5.5	.12 3.3	.19 5.3	.18 5.0
Econ Hopper Reinjection Pressure, "H_2O	.30 8.3	.30 8.3	.21 5.8	.19 5.3	.19 5.3
Overfire Air Fan Static Pressure, "H_2O	1.28 35.4	1.25 34.6	1.24 34.3	1.33 36.8	1.30 36.0
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES	YES
Economizer Hopper Reinjection, YES/NO	YES	YES	YES	YES	YES
F.D. FAN INLET AIR TEMP, °F	80	78	78	77	78
FURNACE					
Ash Bed Thickness, inches	3	3	3	3½	3½
Clinker Formation, YES/NO	NO	NO	NO	NO	NO
Visible Smoke?	NO	NO	NO	NO	NO

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7045.2
Steam Flow, lb/hr 79333
FW Flow, lb/hr —
% Design Capacity 99.2
Evaporation 11.3

TEST NUMBER	17	17	17		
DATE	1-10-79	1-10-79	1-10-79		
DESCRIPTION	LOW O_2 PARTICULATES	→	→		
	100% LOAD	→	→		
INTEGRATORS					
Coal Scale x 200 lbs	098249	098301	098340		
Time of Reading	13:37	15:07	16:12		
Steam Flow x 100 lbs	2526137	2527400	2528273		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S	O.O.S.		
Time of Reading	13:41	15:19	16:23		
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+3.4	+3.6	+3.7		
Windbox Pressure, "H_2O	+1.4	+1.5	+1.5		
Furnace Pressure, "H_2O	-0.24	-0.23	-0.24		
Boiler Outlet Pressure, "H_2O	-1.20	-1.20	-1.20		
Economizer Outlet Pressure, "H_2O	-3.4	-3.6	-3.7		
Dust Collector Outlet Pressure, "H_2O	-7.8	-8.0	-8.3		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	149	145	145		
Steam Header Pressure, psig	145	141	140		
Feedwater Header Pressure, psig	190	186	177		

Sheet 2 of 4

KVB

TEST NUMBER	7	17	17		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	79.0	79.0	83.0		
Air Flow, %	75.0	76.0	78.5		
Excess Oxygen, %	5.0	5.2	5.8		
Economizer Gas Temp Inlet, °F	579	583	590		
Economizer FW Temp Outlet, °F	309	310	320		
Economizer Gas Temp Outlet, °F	391	395	400		
Feedwater Flow x 1000 lb/hr	67	80	76		
Steam Pressure, psig	138	137	134		
Feedwater Temp, °F	219	220	221		
Feedwater Header Press, psig	180	179	174		
Opacity, %	4.0	3.7	4.1		
CONTROLS					
Boiler Master/Stoker	84	83	80		
Fuel Air Ratio	47	47	47		
Forced Draft	70	71	73		
Furnace Draft	79	80	82		
Furnace Draft Bias	-0.18	-0.17	-0.18		
Economizer By-Pass	0	0	0		
Feedwater Flow	81	67	67		
Condensate Flow	34	34	34		
Feedwater Pressure	40	41	42		

Sheet 3 of 4

KVB

TEST NUMBER	17	17	17		
STOKER					
Front Upper OFA Press, "H_2O	.49 13.6	.48 13.3	.50 13.8		
Front Lower OFA Press, "H_2O	.36 10.0	.39 10.8	.36 10.0		
Rear Upper OFA Press, "H_2O	.03 1.0	.03 1.0	.03 1.0		
Rear Lower OFA Press, "H_2O	.18 5.0	.20 5.5	.20 5.5		
Boiler Hopper Reinjection Pressure, "H_2O	.18 5.0	.17 4.7	.19 5.3		
Econ Hopper Reinjection Pressure, "H_2O	.30 8.3	.30 8.3	.30 8.3		
Overfire Air Fan Static Pressure, "H_2O	1.24 34.3	1.25 34.6	1.25 34.6		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP., °F	80	80	80		
FURNACE					
Ash Bed Thickness, inches	3½	4	3½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7239.1
Steam Flow, lb/hr 79 323
FW Flow, lb/hr —
% Design Capacity 99.15
Evaporation 11.0

TEST NUMBER	18	18	18		
DATE	1-15-79	1-15-79	1-15-79		
DESCRIPTION	OPTIMUM O_2 HIGH OFA	→	→		
	PARTICULATES	→	→		
INTEGRATORS					
Coal Scale x 200 lbs	101351	101410	101462		
Time of Reading	13:29	15:08	16:33		
Steam Flow x 100 lbs	2593863	2595164	2596322		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.		
Time of Reading	13:31	15:11	16:37		
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+2.9	+2.5	+2.7		
Windbox Pressure, "H_2O	+1.2	+1.2	+1.1		
Furnace Pressure, "H_2O	-0.20	-0.17	-0.20		
Boiler Outlet Pressure, "H_2O	-1.10	-1.00	-1.00		
Economizer Outlet Pressure, "H_2O	-3.2	-2.9	-3.0		
Dust Collector Outlet Pressure, "H_2O	-7.1	-6.5	-6.8		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	151	150	154		
Steam Header Pressure, psig	147	146	150		
Feedwater Header Pressure, psig	218	197	198		

Sheet 2 of 4

KVB

TEST NUMBER	18	18	18		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	80.0	82.0	80.0		
Air Flow, %	68.0	64.5	80.0		
Excess Oxygen, %	5.8	4.8	5.6		
Economizer Gas Temp Inlet, °F	565	570	570		
Economizer FW Temp Outlet, °F	300	300	310		
Economizer Gas Temp Outlet, °F	380	387	390		
Feedwater Flow x 1000 lb/hr	77	73	74		
Steam Pressure, psig	142	142	145		
Feedwater Temp, °F	218	219	220		
Feedwater Header Press, psig	206	190	190		
Opacity, %	O.O.S.	O.O.S.	O.O.S.		
CONTROLS					
Boiler Master/Stoker	69	70	67		
Fuel Air Ratio	51	50	50		
Forced Draft	65	62	62		
Furnace Draft	74	70	71		
Furnace Draft Bias	-0.18	-0.13	-0.18		
Economizer By-Pass	0	0	0		
Feedwater Flow	70	76	84		
Condensate Flow	34	34	34		
Feedwater Pressure	55	56	56		

Sheet 3 of 4

KVB

TEST NUMBER	18	18	18		
STOKER					
Front Upper OFA Press, "H_2O	.38 10.5	.40 11.1	.39 10.8		
Front Lower OFA Press, "H_2O	.38 10.5	.37 10.2	.36 10.0		
Rear Upper OFA Press, "H_2O	.18 5.0	.17 4.7	.17 4.7		
Rear Lower OFA Press, "H_2O	.30 8.3	.29 8.0	.30 8.3		
Boiler Hopper Reinjection Pressure, "H_2O	.20 5.5	.18 5.0	.18 5.0		
Econ Hopper Reinjection Pressure, "H_2O	.20 5.5	.18 5.0	.18 5.0		
Overfire Air Fan Static Pressure, "H_2O	1.23 34.1	1.25 34.6	1.23 34.1		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP, °F	80	78	80		
FURNACE					
Ash Bed Thickness, inches	2½	2½	2½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7525.4
Steam Flow, lb/hr 79282
FW Flow, lb/hr —
% Design Capacity 99.1
Evaporation 10.5

TEST NUMBER	19	19	19		
DATE	1-16-79	1-16-79	1-16-79		
DESCRIPTION	OPTIMUM O_2 LOW OFA	→	→		
	PARTICULATES	→	→		
INTEGRATORS					
Coal Scale x 200 lbs	102321	102380	102395		
Time of Reading	21:12	22:46	23:10		
Steam Flow x 100 lbs	2614879	2616116	2616425		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.		
Time of Reading	21:14	22:48	23:11		
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+3.4	+3.3	+3.5		
Windbox Pressure, "H_2O	+1.4	+1.4	+1.5		
Furnace Pressure, "H_2O	-0.17	-0.17	-0.17		
Boiler Outlet Pressure, "H_2O	-1.00	-1.00	-1.02		
Economizer Outlet Pressure, "H_2O	-3.1	-3.1	-3.3		
Dust Collector Outlet Pressure, "H_2O	-7.0	-7.0	-7.3		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	148	145	144		
Steam Header Pressure, psig	143	140	140		
Feedwater Header Pressure, psig	198	200	203		

Sheet 2 of 4

KVB

TEST NUMBER	19	19	19		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	81.0	79.4	81.0		
Air Flow, %	74.5	73.0	75.0		
Excess Oxygen, %	5.2	5.0	5.6		
Economizer Gas Temp Inlet, °F	580	575	580		
Economizer FW Temp Outlet, °F	305	300	305		
Economizer Gas Temp Outlet, °F	397	392	392		
Feedwater Flow x 1000 lb/hr	81	83	92		
Steam Pressure, psig	136	139	133		
Feedwater Temp, °F	220	220	220		
Feedwater Header Press, psig	189	200	195		
Opacity, %	4.5	4.0	4.0		
CONTROLS					
Boiler Master/Stoker	70	70	70		
Fuel Air Ratio	45	45	45		
Forced Draft	70	64	69		
Furnace Draft	75	72	75		
Furnace Draft Bias	-0.15	-0.15	-0.15		
Economizer By-Pass	0	0	0		
Feedwater Flow	67	65	79		
Condensate Flow	34	34	34		
Feedwater Pressure	53	53	62		

Sheet 3 of 4

KVB

TEST NUMBER	19	19	19		
STOKER					
Front Upper OFA Press, "H_2O	.17 4.7	.18 5.0	.18 5.0		
Front Lower OFA Press, "H_2O	.25 6.9	.24 6.6	.26 7.2		
Rear Upper OFA Press, "H_2O	.09 2.5	.08 2.2	.09 2.5		
Rear Lower OFA Press, "H_2O	.09 2.5	.09 2.5	.12 3.3		
Boiler Hopper Reinjection Pressure, "H_2O	.18 5.0	.18 5.0	.18 5.0		
Econ Hopper Reinjection Pressure, "H_2O	.22 6.1	.21 5.8	.21 5.8		
Overfire Air Fan Static Pressure, "H_2O	1.28 35.4	1.30 36.0	1.28 35.4		
Boiler Hopper Reinjection, YES/NO	YES	Yes	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP, °F	81	81	81		
FURNACE					
Ash Bed Thickness, inches	3	3½	3½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

Sheet 4 of 4

KVB

NOTES

TEST NO: 19

Test interrupted temporarily by change in load.

TEST NO:

TEST NO:

TEST NO:

TEST NO:

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 5256.2
Steam Flow, lb/hr 59754
FW Flow, lb/hr —
% Design Capacity 74.7
Evaporation 11.4

TEST NUMBER	20	20	20		
DATE	1-17-79	1-17-79	1-17-79		
DESCRIPTION	PARTICULATES NORM O_2	PARTICULATES	→		
	NORM OFA	→	→		
INTEGRATORS					
Coal Scale x 200 lbs	102930	102963	102983		
Time of Reading	16:17	17:31	18:18		
Steam Flow x 100 lbs	2628065	2628874	2629280		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S		
Time of Reading	16:19	17:40	18:21		
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+2.0	+2.0	+2.0		
Windbox Pressure, "H_2O	+1.0	+1.0	+0.9		
Furnace Pressure, "H_2O	-0.19	-0.18	-0.18		
Boiler Outlet Pressure, "H_2O	-0.85	-0.80	-0.80		
Economizer Outlet Pressure, "H_2O	-2.6	-2.5	-2.5		
Dust Collector Outlet Pressure, "H_2O	-5.8	-5.5	-5.5		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	144	144	144		
Steam Header Pressure, psig	142	142	141		
Feedwater Header Pressure, psig	210	210	208		

Sheet 2 of 4

KVB

TEST NUMBER	20	20	20		
-					
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	61.0	60.5	61.0		
Air Flow, %	57.5	57.5	57.5		
Excess Oxygen, %	8.0	8.2	7.8		
Economizer Gas Temp Inlet, °F	530	530	530		
Economizer FW Temp Outlet, °F	310	310	310		
Economizer Gas Temp Outlet, °F	360	365	366		
Feedwater Flow x 1000 lb/hr	60	55	58		
Steam Pressure, psig	135	138	138		
Feedwater Temp, °F	220	220	220		
Feedwater Header Press, psig	198	200	202		
Opacity, %	3.2	3.2	3.3		
CONTROLS					
Boiler Master/Stoker	45	45	44		
Fuel Air Ratio	48	47	47		
Forced Draft	56	55	55		
Furnace Draft	63	65	64		
Furnace Draft Bias	-0.18	-0.18	-0.18		
Economizer By-Pass	0	0	0		
Feedwater Flow	64	63	59		
Condensate Flow	34	34	34		
Feedwater Pressure	76	75	75		

Sheet 3 of 4

KVB

TEST NUMBER	20	20	20		
STOKER					
Front Upper OFA Press, "H_2O	.49 13.6	.49 13.6	.49 13.6		
Front Lower OFA Press, "H_2O	.36 10.0	.36 10.0	.36 10.0		
Rear Upper OFA Press, "H_2O	.06 1.7	.05 1.4	.06 1.7		
Rear Lower OFA Press, "H_2O	.17 4.7	.18 5.0	.18 5.0		
Boiler Hopper Reinjection Pressure, "H_2O	.18 5.0	.18 5.0	.18 5.0		
Econ Hopper Reinjection Pressure, "H_2O	.30 8.3	.30 8.3	.30 8.3		
Overfire Air Fan Static Pressure, "H_2O	1.25 34.6	1.25 34.6	1.25 34.6		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP, °F	76	76	74		
FURNACE					
Ash Bed Thickness, inches	2	2	2		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

NOTES

TEST NO: 20

IMPINGER TRAIN AT D.C. OUTLET FELL, THAT TEST HAD TO BE HALTED BEFORE COMPLETION. ECON. OUTLET TEST OK.

TEST NO:

TEST NO:

TEST NO:

TEST NO:

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 5625.0

Steam Flow, lb/hr 61116

FW Flow, lb/hr —

% Design Capacity 76.4

Evaporation 10.9

TEST NUMBER	21	21	21		
DATE	1-24-79	1-24-79	1-24-79		
DESCRIPTION	75% LOAD NORM O_2	→	→		
	NORM OFA PARTICULATES	→	→		
INTEGRATORS					
Coal Scale x 200 lbs	106879	106911	106939		
Time of Reading	10:18	11:26	12:26		
Steam Flow x 100 lbs	2718413	2719107	2719727		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.		
Time of Reading	10:19	11:28	12:28		
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+1.85	+2.0	+2.0		
Windbox Pressure, "H_2O	+0.90	+1.0	+1.0		
Furnace Pressure, "H_2O	-0.25	-0.23	-0.23		
Boiler Outlet Pressure, "H_2O	-0.95	-0.95	-0.95		
Economizer Outlet Pressure, "H_2O	-2.5	-2.6	-2.6		
Dust Collector Outlet Pressure, "H_2O	-5.6	-5.7	-5.6		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	150	150	148		
Steam Header Pressure, psig	150	150	147		
Feedwater Header Pressure, psig	215	228	220		

Sheet 2 of 4

KVB

TEST NUMBER	21	21	21		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	59.0	62.0	62.0		
Air Flow, %	56.5	58.0	58.0		
Excess Oxygen, %	7.0	7.3	7.5		
Economizer Gas Temp Inlet, °F	530	537	535		
Economizer FW Temp Outlet, °F	312	310	309		
Economizer Gas Temp Outlet, °F	367	370	370		
Feedwater Flow x 1000 lb/hr	60	59	58		
Steam Pressure, psig	145	145	141		
Feedwater Temp, °F	219	219	219		
Feedwater Header Press, psig	203	215	205		
Opacity, %	O.O.S.	O.O.S.	O.O.S.		
CONTROLS					
Boiler Master/Stoker	56	55	54		
Fuel Air Ratio	50	47	47		
Forced Draft	54	55	57		
Furnace Draft	66	66	66		
Furnace Draft Bias	-0.20	-0.20	-0.20		
Economizer By-Pass	0	0	0		
Feedwater Flow	64	61	65		
Condensate Flow	30	30	30		
Feedwater Pressure	55	55	55		

Sheet 3 of 4

KVB

TEST NUMBER	21	21	21		
-					
STOKER					
Front Upper OFA Press, "H_2O	0.48 13.3	0.48 13.3	0.48 13.3		
Front Lower OFA Press, "H_2O	0.36 10.0	0.35 9.7	0.36 10.0		
Rear Upper OFA Press, "H_2O	0.06 1.7	0.06 1.7	0.06 1.7		
Rear Lower OFA Press, "H_2O	0.19 5.3	0.17 4.7	0.19 5.3		
Boiler Hopper Reinjection Pressure, "H_2O	0.17 4.7	0.17 4.7	0.18 5.0		
Econ Hopper Reinjection Pressure, "H_2O	0.30 8.3	0.29 8.0	.29 8.0		
Overfire Air Fan Static Pressure, "H_2O	1.25 34.6	1.30 36.0	1.24 34.3		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP, °F	78	82	82		
FURNACE					
Ash Bed Thickness, inches	3½	3½	2½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 6927.3
Steam Flow, lb/hr 79473
FW Flow, lb/hr —
% Design Capacity 99.3
Evaporation 11.5

TEST NUMBER	22	22	22		
DATE	1-31-79	1-31-79	1-31-79		
DESCRIPTION	OPTIMUM OFA OPTIMUM O_2	→	→		
	SASS SO_3	→	→		
INTEGRATORS					
Coal Scale x 200 lbs	110645	110832	110899		
Time of Reading	10:52	16:15	18:12		
Steam Flow x 100 lbs	2801994	2806291	2807928		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.		
Time of Reading	10:54	16:18	18:22		
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+2.6	+2.5	+2.5		
Windbox Pressure, "H_2O	+1.2	+1.2	+1.1		
Furnace Pressure, "H_2O	-0.22	-0.22	-0.22		
Boiler Outlet Pressure, "H_2O	-1.00	-1.00	-1.00		
Economizer Outlet Pressure, "H_2O	-3.0	-3.0	-3.0		
Dust Collector Outlet Pressure, "H_2O	-6.5	-6.7	-6.8		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	120	145	145		
Steam Header Pressure, psig	116	141	140		
Feedwater Header Pressure, psig	162	200	204		

Sheet 2 of 4

KVB

TEST NUMBER	22	22	22		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	80.5	81.0	79.5		
Air Flow, %	68.0	65.0	79.5		
Excess Oxygen, %	5.4	5.2	5.2		
Economizer Gas Temp Inlet, °F	560	580	575		
Economizer FW Temp Outlet, °F	300	310	300		
Economizer Gas Temp Outlet, °F	390	390	390		
Feedwater Flow x 1000 lb/hr	80	74	65		
Steam Pressure, psig	105	136	135		
Feedwater Temp, °F	220	220	220		
Feedwater Header Press, psig	151	190	195		
Opacity, %	O.O.S.	O.O.S.	O.O.S.		
CONTROLS					
Boiler Master/Stoker	72	71	71		
Fuel Air Ratio	50	50	50		
Forced Draft	59	62	61		
Furnace Draft	71	72	73		
Furnace Draft Bias	-0.18	-0.19	-0.19		
Economizer By-Pass	0	0	0		
Feedwater Flow	91	75	72		
Condensate Flow	32.5	32	32		
Feedwater Pressure	51	49	49		

Sheet 3 of 4

KVB

TEST NUMBER	22	22	22		
-					
STOKER					
Front Upper OFA Press, "H_2O	0.38 10.5	0.37 10.2	.37 10.2		
Front Lower OFA Press, "H_2O	0.35 9.7	0.35 9.7	0.34 9.4		
Rear Upper OFA Press, "H_2O	0.21 5.8	0.19 5.3	0.19 5.3		
Rear Lower OFA Press, "H_2O	0.29 8.0	0.29 8.0	0.29 8.0		
Boiler Hopper Reinjection Pressure, "H_2O	0.18 5.0	0.19 5.3	0.18 5.0		
Econ Hopper Reinjection Pressure, "H_2O	0.18 5.0	0.20 5.5	0.18 5.0		
Overfire Air Fan Static Pressure, "H_2O	1.25 34.6	1.24 34.3	1.25 34.6		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP, °F	74	75	76		
FURNACE					
Ash Bed Thickness, inches	4	3½	2½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7041.3
Steam Flow, lb/hr 79989
FW Flow, lb/hr —
% Design Capacity 100.0
Evaporation 11.4

NO ECON. HOPPER REINJECTION

TEST NUMBER	23	23	23	23	
DATE	2-1-79	2-1-79	2-1-79	2-1-79	
DESCRIPTION	OPTIMUM O_2 OPTIMUM OFA	→	→	→	
	BRINK TEST	→	PARTICULATES	→	
INTEGRATORS					
Coal Scale x 200 lbs	111348	111397	111451	111561	
Time of Reading	10:46	12:11	13:45	16:49	
Steam Flow x 100 lbs	2817904	2819019	2820261	2822810	
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.	O.O.S.	
Time of Reading	10:48	12:13	13:47	16:56	
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+3.2	+2.9	+2.9	+3.0	
Windbox Pressure, "H_2O	+1.4	+1.3	+1.3	+1.3	
Furnace Pressure, "H_2O	-0.22	-0.22	-0.22	-0.20	
Boiler Outlet Pressure, "H_2O	-1.10	-1.00	-1.00	-1.00	
Economizer Outlet Pressure, "H_2O	-3.3	-3.1	-3.1	-3.2	
Dust Collector Outlet Pressure, "H_2O	-7.4	-6.8	-7.0	-7.4	
PRESSURE GAUGES					
Boiler Steam Pressure, psig	142	143	140	145	
Steam Header Pressure, psig	138	139	135	140	
Feedwater Header Pressure, psig	191	191	190	196	

KVB

TEST NUMBER	23	23	23	23	
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	80.0	80.0	80.3	82.0	
Air Flow, %	70.0	68.0	68.0	69.0	
Excess Oxygen, %	5.6	5.5	5.2	5.4	
Economizer Gas Temp Inlet, °F	579	570	575	580	
Economizer FW Temp Outlet, °F	305	306	302	305	
Economizer Gas Temp Outlet, °F	395	390	390	390	
Feedwater Flow x 1000 lb/hr	73	74	75	78	
Steam Pressure, psig	133	132	130	135	
Feedwater Temp, °F	220	220	220	221	
Feedwater Header Press, psig	186	182	188	189	
Opacity, %	O.O.S.	O.O.S.	O.O.S.	O.O.S.	
CONTROLS					
Boiler Master/Stoker	80	80	80	75	
Fuel Air Ratio	50	50	50	50	
Forced Draft	65	62	62	66	
Furnace Draft	76	74	74	76	
Furnace Draft Bias	-0.18	-0.18	-0.18	-0.15	
Economizer By-Pass	0	0	0	0	
Feedwater Flow	75	81	72	79	
Condensate Flow	33	33	33	32	
Feedwater Pressure	47	47	53	47	

Sheet 3 of 4

KVB

TEST NUMBER	23	23	23	23	
STOKER					
Front Upper OFA Press, "H_2O	0.39 10.8	0.39 10.8	0.39 10.8	0.37 10.2	
Front Lower OFA Press, "H_2O	0.35 9.7	0.35 9.7	0.35 9.7	0.35 9.7	
Rear Upper OFA Press, "H_2O	0.18 5.0	0.18 5.0	0.18 5.0	0.18 5.0	
Rear Lower OFA Press, "H_2O	0.29 8.0	0.29 8.0	0.29 8.0	0.30 8.3	
Boiler Hopper Reinjection Pressure, "H_2O	0.18 5.0	0.18 5.0	0.18 5.0	0.18 5.0	
Econ Hopper Reinjection Pressure, "H_2O	0.05 1.4	0.01 0.3	0.01 0.3	0.01 0.3	
Overfire Air Fan Static Pressure, "H_2O	1.26 34.9	1.28 35.4	1.24 34.3	1.21 33.5	
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES	
Economizer Hopper Reinjection, YES/NO	NO	NO	NO	NO	
F.D. FAN INLET AIR TEMP, °F	81	83	84	82	
FURNACE					
Ash Bed Thickness, inches	3½	3½	4	3	
Clinker Formation, YES/NO	NO	NO	NO	NO	
Visible Smoke?	NO	NO	NO	NO	

REINJECTION AIR TO ECONOMIZER HOPPERS OFF AT 10:28 HRS BY CLOSING AIR DAMPER AND HOPPER GATES

3 FRESH BARRELS PLACED UNDER ECON. HOPPERS AFTER UNPLUGGED AT 15:55 HRS:

LH - BBL #1, TARE WT. = 36.5#
C - BBL #2, TARE WT. = 50.0#
RH - BBL #3, TARE WT. = 41.0#

THESE BARRELS WERE REMOVED FROM HOPPERS AT 18:05 HRS.

Sheet 4 of 4

KVB

NOTES

TEST NO: 23

DISCOVERED DURING TEST THAT THE CENTER + RH SIDE ECON. HOPPERS WERE ALMOST COMPLETELY PLUGGED. THE LH SIDE HOPPER WAS OK. THIS WAS DISCOVERED AFTER BRINK TEST & DURING PARTICULATE TESTS.

TEST NO:

TEST NO:

TEST NO:

TEST NO:

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7495.4
Steam Flow, lb/hr 81957
FW Flow, lb/hr -
% Design Capacity 102.4
Evaporation 10.9

TEST NUMBER	24	24	24	24	24
DATE	2-6-79	2-6-79	2-6-79	2-6-79	2-6-79
DESCRIPTION	OPT. O_2, OPT. OFA BRINK TEST	→	PARTICULATES	→	→
INTEGRATORS					
Coal Scale x 200 lbs	114932	114989	115042	115077	115135
Time of Reading	12:01	13:30	14:52	15:47	17:26
Steam Flow x 100 lbs	2896027	2897235	2898449	2899146	2900480
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.	O.O.S.	O.O.S.
Time of Reading	12:03	13:32	15:00	15:51	17:29
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+2.7	+2.6	+2.2	+2.3	+2.1
Windbox Pressure, "H_2O	+1.2	+1.2	+1.0	+1.0	+1.0
Furnace Pressure, "H_2O	-0.18	-0.18	-0.22	-0.22	-0.20
Boiler Outlet Pressure, "H_2O	-0.95	-0.94	-1.00	-1.05	-1.00
Economizer Outlet Pressure, "H_2O	-3.0	-3.0	-3.0	-3.0	-2.9
Dust Collector Outlet Pressure, "H_2O	-6.7	-6.6	-6.5	-6.5	-6.2
PRESSURE GAUGES					
Boiler Steam Pressure, psig	147	148	148	144	147
Steam Header Pressure, psig	144	144	144	140	143
Feedwater Header Pressure, psig	210	210	199	214	210

KVB

TEST NUMBER	24	24	24	24	24
-					
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	83.0	83.0	82.5	85.5	81.0
Air Flow, %	66.0	65.5	61.5	61.0	67.5
Excess Oxygen, %	5.4	5.5	5.2	5.2	5.6
Economizer Gas Temp Inlet, °F	570	570	568	566	565
Economizer FW Temp Outlet, °F	300	300	300	300	300
Economizer Gas Temp Outlet, °F	390	390	390	385	385
Feedwater Flow x 1000 lb/hr	66	77	80	73	70
Steam Pressure, psig	140	138	140	136	139
Feedwater Temp, °F	221	220	221	220	220
Feedwater Header Press, psig	225	205	205	210	202
Opacity, %	O.O.S.	O.O.S.	O.O.S.	O.O.S.	O.O.S.
CONTROLS					
Boiler Master/Stoker	73	72	71	71	70
Fuel Air Ratio	50	50	50	50	50
Forced Draft	62	62	56	59	59
Furnace Draft	71	70	70	70	68
Furnace Draft Bias	-0.15	-0.15	-0.20	-0.20	-0.20
Economizer By-Pass	0	0	0	0	0
Feedwater Flow	64	70	84	67	68
Condensate Flow	32	32	31	31	31
Feedwater Pressure	68	58	64	59	54

Sheet 3 of 4

KVB

TEST NUMBER	24	24	24	24	24
STOKER					
Front Upper OFA Press, "H_2O	0.39 10.8	0.36 10.0	0.40 11.1	0.40 11.1	0.38 10.5
Front Lower OFA Press, "H_2O	0.36 10.0	0.36 10.0	0.36 10.0	0.35 9.7	0.36 10.0
Rear Upper OFA Press, "H_2O	0.20 5.5	0.22 6.1	0.20 5.5	0.20 5.5	0.21 5.8
Rear Lower OFA Press, "H_2O	0.30 8.3	0.29 8.0	0.28 7.8	0.29 8.0	0.29 8.0
Boiler Hopper Reinjection Pressure, "H_2O	0.18 5.0	0.17 4.7	0.17 4.7	0.17 4.7	0.17 4.7
Econ Hopper Reinjection Pressure, "H_2O	0.19 5.0	0.18 5.0	0.17 4.7	0.17 4.7	0.17 4.7
Overfire Air Fan Static Pressure, "H_2O	1.28 35.4	1.27 35.2	1.28 35.4	1.27 35.2	1.27 35.2
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES	YES
Economizer Hopper Reinjection, YES/NO	YES	YES	YES	YES	YES
F.D. FAN INLET AIR TEMP, °F	68	70	70	70	68
FURNACE					
Ash Bed Thickness, inches	3	3	3	3	2½
Clinker Formation, YES/NO	NO	NO	NO	NO	NO
Visible Smoke?	NO	NO	NO	NO	NO

Sheet 1 of 4

Coal Flow, lb/hr 7238.1
Steam Flow, lb/hr 79472
FW Flow, lb/hr —
% Design Capacity 99.3
Evaporation 11.0

PANEL BOARD DATA SHEET
ABMA TEST SITE F

TEST NUMBER	23A	23A			
DATE	2-8-79	2-8-79			
DESCRIPTION	BRINK TEST OPT. O_2 + OFA	→			
	NO. ECON. HOPPER REINJ.	→			
INTEGRATORS					
Coal Scale x 200 lbs	116488	116526			
Time of Reading	12:14	13:17			
Steam Flow x 100 lbs	2929865	2930567			
Feedwater Flow x 100 lbs	0.0.5	0.0.5			
Time of Reading	12:19	13:12			
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+2.0	+2.1			
Windbox Pressure, "H_2O	0.9	+1.0			
Furnace Pressure, "H_2O	-0.25	-0.25			
Boiler Outlet Pressure, "H_2O	-1.00	-1.00			
Economizer Outlet Pressure, "H_2O	-2.8	-3.0			
Dust Collector Outlet Pressure, "H_2O	-6.1	-6.3			
PRESSURE GAUGES					
Boiler Steam Pressure, psig	144	146			
Steam Header Pressure, psig	140	142			
Feedwater Header Pressure, psig	218	218			

Sheet 2 of 4

KVB

TEST NUMBER	23A	23A			
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	80.0	79.5			
Air Flow, %	58.0	58.0			
Excess Oxygen, %	5.2	5.2			
Economizer Gas Temp Inlet, °F	560	570			
Economizer FW Temp Outlet, °F	300	300			
Economizer Gas Temp Outlet, °F	384	387			
Feedwater Flow x 1000 lb/hr	70	78			
Steam Pressure, psig	135	137			
Feedwater Temp, °F	221	221			
Feedwater Header Press, psig	210	210			
Opacity, %	O.O.S.	O.O.S.			
CONTROLS					
Boiler Master/Stoker	70	73			
Fuel Air Ratio	50	50			
Forced Draft	55	59			
Furnace Draft	69	70			
Furnace Draft Bias	-0.23	-0.23			
Economizer By-Pass	0	0			
Feedwater Flow	65	71			
Condensate Flow	31	31			
Feedwater Pressure	54	62			

Sheet 3 of 4

KVB

TEST NUMBER	23A	23A			
STOKER					
Front Upper OFA Press, "H_2O	0.40 11.1	0.39 10.8			
Front Lower OFA Press, "H_2O	0.36 9.96	0.36 9.96			
Rear Upper OFA Press, "H_2O	0.17 4.70	0.20 5.53			
Rear Lower OFA Press, "H_2O	0.29 8.02	0.29 8.02			
Boiler Hopper Reinjection Pressure, "H_2O	0.18 4.98	0.18 4.98			
Econ Hopper Reinjection Pressure, "H_2O	0.0 0.0	0.0 0.0			
Overfire Air Fan Static Pressure, "H_2O	1.21	1.21			
Boiler Hopper Reinjection, YES/NO	YES	YES			
Economizer Hopper Reinjection, YES/NO	NO	NO			
F.D. FAN INLET AIR TEMP, °F	83	82			
FURNACE					
Ash Bed Thickness, inches	3	3			
Clinker Formation, YES/NO	NO	NO			
Visible Smoke?	NO	NO			

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 6975.6
Steam Flow, lb/hr 79488
FW Flow, lb/hr —
% Design Capacity 99.4
Evaporation 11.4

O_2 VARIATIONS

TEST NUMBER	25	26	27	28	
DATE	2-12-79	2-12-79	2-12-79	2-12-79	
DESCRIPTION	HIGH O_2	BASELINE	Med-Lo O_2	Low O_2	
	COAL B			→	
INTEGRATORS					
Coal Scale x 200 lbs	119384	119429	119476	119527	
Time of Reading	10:17	11:32	12:53	14:23	
Steam Flow x 100 lbs	2993980	2994985	2996068	2997239	
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.	O.O.S.	
Time of Reading	10:18	11:34	12:54	14:24	
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+4.9	+3.9	+2.4	+1.9	
Windbox Pressure, "H_2O	+1.9	+1.5	+1.1	+0.9	
Furnace Pressure, "H_2O	-0.17	-0.25	-0.25	-0.22	
Boiler Outlet Pressure, "H_2O	-1.20	-1.25	-1.00	-0.85	
Economizer Outlet Pressure, "H_2O	-4.0	-3.8	-3.0	-2.6	
Dust Collector Outlet Pressure, "H_2O	-9.1	-8.6	-6.5	-5.7	
PRESSURE GAUGES					
Boiler Steam Pressure, psig	145	147	143	150	
Steam Header Pressure, psig	141	143	140	145	
Feedwater Header Pressure, psig	190	190	183	202	

Sheet 2 of 4

KVB

TEST NUMBER	25	26	27	28	
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	78.0	81.0	79.0	79.0	
Air Flow, %	92.5	83.5	65.0	56.5	
Excess Oxygen, %	8.0	7.0	6.2	4.5	
Economizer Gas Temp Inlet, °F	585	589	560	560	
Economizer FW Temp Outlet, °F	320	313	304	300	
Economizer Gas Temp Outlet, °F	400	400	389	386	
Feedwater Flow x 1000 lb/hr	74	80	72	77	
Steam Pressure, psig	137	139	134	140	
Feedwater Temp, °F	220	220	220	220	
Feedwater Header Press, psig	183	183	175	195	
Opacity, %	O.O.S.	O.O.S.	O.O.S.	O.O.S.	
CONTROLS					
Boiler Master/Stoker	81	79	68	71	
Fuel Air Ratio	50	50	50	50	
Forced Draft	96	73	59	55	
Furnace Draft	100+	85	70	66	
Furnace Draft Bias	-0.08	-0.20	-0.20	-0.20	
Economizer By-Pass	0	0	0	0	
Feedwater Flow	80	91	83	76	
Condensate Flow	30	30	30	30	
Feedwater Pressure	55	55	55	55	

KVB

TEST NUMBER	25	26	27	28	
STOKER					
Front Upper OFA Press, "H_2O	0.49 13.6	0.49 13.6	0.49 13.6	0.48 13.3	
Front Lower OFA Press, "H_2O	0.32 8.9	0.33 9.1	0.33 9.1	0.34 9.4	
Rear Upper OFA Press, "H_2O	0.07 1.9	0.06 1.7	0.07 1.9	0.06 1.7	
Rear Lower OFA Press, "H_2O	0.19 5.3	0.18 5.0	0.18 5.0	0.18 5.0	
Boiler Hopper Reinjection Pressure, "H_2O	0.19 5.3	0.18 5.0	0.18 5.0	0.19 5.3	
Econ Hopper Reinjection Pressure, "H_2O	0.30 8.3	0.28 7.8	0.28 7.8	0.29 8.0	
Overfire Air Fan Static Pressure, "H_2O	1.23 34.1	1.23 34.1	1.23 34.1	1.23 34.1	
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES	
Economizer Hopper Reinjection, YES/NO	YES	YES	YES	YES	
F.D. FAN INLET AIR TEMP, °F	82	82	81	80	
FURNACE					
Ash Bed Thickness, inches	3	3	2½	3	
Clinker Formation, YES/NO	NO	NO	NO	NO	
Visible Smoke?	NO	NO	NO	NO	

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 6552.1
Steam Flow, lb/hr 80,400
FW Flow, lb/hr —
% Design Capacity 100.5
Evaporation 12.3

COAL B

TEST NUMBER	29	29	29		
DATE	2-12-79	2-12-79	2-12-79		
DESCRIPTION	OPT. O_2 & OFA PARTICULATES	BRINK & PARTICULATES	→ BRINK		
INTEGRATORS					
Coal Scale x 200 lbs	119682	119716	119771		
Time of Reading	18:50	19:56	21:33		
Steam Flow x 100 lbs	3000757	3001850	3002968		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.		
Time of Reading	18:53	20:15	21:38		
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+2.2	+2.2	+2.2		
Windbox Pressure, "H_2O	+1.0	+1.0	+1.0		
Furnace Pressure, "H_2O	-0.25	-0.25	-0.25		
Boiler Outlet Pressure, "H_2O	-1.00	-1.00	-1.00		
Economizer Outlet Pressure, "H_2O	-2.9	-3.0	-3.0		
Dust Collector Outlet Pressure, "H_2O	-6.3	-6.5	-6.4		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	142	147	145		
Steam Header Pressure, psig	137	142	140		
Feedwater Header Pressure, psig	194	209	205		

Sheet 2 of 4

TEST NUMBER	29	29	29		
-					
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	82.0	80.0	80.5		
Air Flow, %	60.0	60.0	60.0		
Excess Oxygen, %	5.0	5.0	5.5		
Economizer Gas Temp Inlet, °F	570	570	569		
Economizer FW Temp Outlet, °F	300	300	305		
Economizer Gas Temp Outlet, °F	390	388	385		
Feedwater Flow x 1000 lb/hr	100	80	84		
Steam Pressure, psig	132	138	135		
Feedwater Temp, °F	220	220	220		
Feedwater Header Press, psig	192	202	205		
Opacity, %	O.O.S.	O.O.S.	O.O.S.		
CONTROLS					
Boiler Master/Stoker	75	71	71		
Fuel Air Ratio	50	50	50		
Forced Draft	58	60	60		
Furnace Draft	70	70	70		
Furnace Draft Bias	-0.20	-0.20	-0.20		
Economizer By-Pass	0	0	0		
Feedwater Flow	92	74	74		
Condensate Flow	30	30	30		
Feedwater Pressure	75	65	56		

Sheet 3 of 4

KVB

TEST NUMBER	29	29	29		
STOKER					
Front Upper OFA Press, "H_2O	0.38 10.5	0.37 10.2	0.38 10.5		
Front Lower OFA Press, "H_2O	0.36 10.0	1.35 9.7	0.35 9.7		
Rear Upper OFA Press, "H_2O	0.18 5.0	0.18 5.0	0.19 5.3		
Rear Lower OFA Press, "H_2O	0.29 8.0	0.29 8.0	0.29 8.0		
Boiler Hopper Reinjection Pressure, "H_2O	0.18 5.0	0.18 5.0	0.18 5.0		
Econ Hopper Reinjection Pressure, "H_2O	0.17 4.7	0.17 4.7	0.18 5.0		
Overfire Air Fan Static Pressure, "H_2O	1.23 34.1	1.23 34.1	1.23 34.1		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP, °F	80	80	79		
FURNACE					
Ash Bed Thickness, inches	3	2½	2½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

KVB

NOTES

TEST NO: 29

SNOW CAUSED MOIST COAL.

TEST NO:

TEST NO:

TEST NO:

TEST NO:

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 7854
Steam Flow, lb/hr 81,499
FW Flow, lb/hr
% Design Capacity 97.2
Evaporation

TEST NUMBER	30	30	30	30	30
DATE	2-13-79	2-13-79	2-13-79	2-13-79	2-13-79
DESCRIPTION	LOW O_2 HIGH OFA	→	→	→	→
	GOKSOYR-ROSS	→	SASS	SASS	SASS
INTEGRATORS					
Coal Scale x 200 lbs	120197	120251	120355	120390	120448
Time of Reading	11:01	12:31	15:29	16:29	18:08
Steam Flow x 100 lbs	3012938	3013797	3016300	3017081	3018412
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.	O.O.S.	O.O.S.
Time of Reading	11:26	12:29	15:33	16:31	18:09
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+3.0		+2.9	+2.9	+2.6
Windbox Pressure, "H_2O	+1.2		+1.2	+1.3	+1.2
Furnace Pressure, "H_2O	-0.25		-0.20	-0.20	-0.23
Boiler Outlet Pressure, "H_2O	-1.1		-1.0	-1.0	-0.9
Economizer Outlet Pressure, "H_2O	-3.3		-3.1	-3.1	-3.0
Dust Collector Outlet Pressure, "H_2O	-7.3		-6.8	-6.8	-6.5
PRESSURE GAUGES					
Boiler Steam Pressure, psig	145		146	145	141
Steam Header Pressure, psig	140		141	140	137
Feedwater Header Pressure, psig	200		192	205	208

Sheet 2 of 4

KVB

TEST NUMBER	30		30	30	30
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	82.0		82.0	82.0	80.5
Air Flow, %	67.5		67.0	67.0	67.0
Excess Oxygen, %	5.3		5.6	5.2	5.4
Economizer Gas Temp Inlet, °F	570		570	577	570
Economizer FW Temp Outlet, °F	310		307	303	300
Economizer Gas Temp Outlet, °F	390		390	391	390
Feedwater Flow x 1000 lb/hr	79		86	85	81
Steam Pressure, psig	135		135	135	135
Feedwater Temp, °F	220		221	221	220
Feedwater Header Press, psig	194		190	195	200
Opacity, %	O.O.S.		O.O.S.	O.O.S.	O.O.S.
CONTROLS					
Boiler Master/Stoker	76		76	76	75
Fuel Air Ratio	50		50	50	50
Forced Draft	65		64	63	60
Furnace Draft	75		73	72	70
Furnace Draft Bias	-0.20		-0.17	-0.17	-0.18
Economizer By-Pass	0		0	0	0
Feedwater Flow	75		84	77	65
Condensate Flow	30		30	30	30
Feedwater Pressure	51		47	47	45

Sheet 3 of 4

TEST NUMBER	30		30	30	30
STOKER					
Front Upper OFA Press, "H_2O	0.38 10.5		0.38 10.5	0.38 10.5	0.38 10.5
Front Lower OFA Press, "H_2O	0.35 9.7		0.33 9.1	0.34 9.4	0.33 9.7
Rear Upper OFA Press, "H_2O	0.19 5.3		0.19 5.3	0.20 5.5	0.20 5.5
Rear Lower OFA Press, "H_2O	0.29 8.0		0.29 8.0	0.29 8.0	0.29 8.0
Boiler Hopper Reinjection Pressure, "H_2O	0.18 5.0		0.18 5.0	0.19 5.3	0.18 5.0
Econ Hopper Reinjection Pressure, "H_2O	0.18 5.0		0.18 5.0	0.18 5.0	0.18 5.0
Overfire Air Fan Static Pressure, "H_2O	1.23 34.1		1.23 34.1	1.22 33.8	1.22 33.8
Boiler Hopper Reinjection, YES/NO	YES		YES	YES	YES
Economizer Hopper Reinjection, YES/NO	YES		YES	YES	YES
F.D. FAN INLET AIR TEMP, °F	78		83	83	82
FURNACE					
Ash Bed Thickness, inches	3		3	3	3½
Clinker Formation, YES/NO	NO		NO	NO	NO
Visible Smoke?	NO		NO	NO	NO

NOTES

TEST NO: 30

SOME LARGE (5" DIAM) CHUNKS OF COAL BURNING NEAR SPREADER PROBABLY DUE TO MOIST COAL.

TEST NO:

TEST NO:

TEST NO:

TEST NO:

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 5333.3
Steam Flow, lb/hr 59970
FW Flow, lb/hr —
% Design Capacity 75.0
Evaporation 11.2

COAL B

TEST NUMBER	31	31	32	33	34
DATE	2-14-79	2-14-79	2-14-79	2-14-79	2-14-79
DESCRIPTION	NORM OFA O_2 VARIATIONS				
	BASELINE	→	HIGH O_2	MED. LO O_2	LO O_2
INTEGRATORS					
Coal Scale x 200 lbs	120982	121008	121025	121048	121074
Time of Reading	10:43	11:43	12:22	13:13	14:10
Steam Flow x 100 lbs	3030527	3031122	3031508	3032024	3032555
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.	O.O.S.	O.O.S.
Time of Reading	10:44	11:44	12:23	13:15	14:07
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+2.4	+2.4	+3.9	+1.9	+1.1
Windbox Pressure, "H_2O	+1.1	+1.1	+1.5	+1.0	+0.6
Furnace Pressure, "H_2O	-0.18	-0.20	-0.20	-0.16	-0.14
Boiler Outlet Pressure, "H_2O	-0.9	-0.9	-1.1	-0.75	-0.60
Economizer Outlet Pressure, "H_2O	-2.8	-2.7	-3.6	-2.4	-1.8
Dust Collector Outlet Pressure, "H_2O	-6.2	-6.1	-8.3	-5.2	-4.0
PRESSURE GAUGES					
Boiler Steam Pressure, psig	145	145	145	148	150
Steam Header Pressure, psig	142	145	145	146	148
Feedwater Header Pressure, psig	217	230	240	243	223

Sheet 2 of 4

TEST NUMBER	31	31	32	33	34
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	60.0	60.0	60.0	60.5	62.0
Air Flow, %	61.0	61.0	80.0	53.0	42.0
Excess Oxygen, %	8.9	8.6	9.9	7.8	5.7
Economizer Gas Temp Inlet, °F	530	535	550	530	519
Economizer FW Temp Outlet, °F	310	310	322	300	296
Economizer Gas Temp Outlet, °F	370	370	380	370	360
Feedwater Flow x 1000 lb/hr	52	56	56	53	60
Steam Pressure, psig	138	140	140	143	145
Feedwater Temp, °F	220	220	220	220	220
Feedwater Header Press, psig	210	225	255	250	210
Opacity, %	O.O.S.	O.O.S.	O.O.S.	O.O.S.	O.O.S.
CONTROLS					
Boiler Master/Stoker	55	55	55	55	54
Fuel Air Ratio	50	50	50	50	31
Forced Draft	60	61	75	59	49
Furnace Draft	70	70	84	65	58
Furnace Draft Bias	-0.18	-0.20	-0.20	-0.20	-0.20
Economizer By-Pass	0	0	0	0	0
Feedwater Flow	61	58	55	55	62
Condensate Flow	30	30	30	30	30
Feedwater Pressure	54	59	59	52	51

Sheet 3 of 4

KVB

TEST NUMBER	31	31	32	33	34
--					
STOKER					
Front Upper OFA Press, "H_2O	0.50 13.8	0.50 13.8	0.50 13.8	0.50 13.8	0.49 13.6
Front Lower OFA Press, "H_2O	0.35 9.7	0.35 9.7	0.35 9.7	0.35 9.7	0.35 9.7
Rear Upper OFA Press, "H_2O	0.05 1.4	0.05 1.4	0.05 1.4	0.05 1.4	0.05 1.4
Rear Lower OFA Press, "H_2O	0.20 5.5	0.23 6.4	0.19 5.3	0.21 5.8	0.21 5.8
Boiler Hopper Reinjection Pressure, "H_2O	0.22 6.1	0.22 6.1	0.21 5.8	0.22 6.1	0.21 5.8
Econ Hopper Reinjection Pressure, "H_2O	0.31 8.6	0.32 8.9	0.30 8.3	0.31 8.6	0.31 8.6
Overfire Air Fan Static Pressure, "H_2O	1.30 36.0	1.31 36.3	1.30 36.0	1.30 36.0	1.30 36.0
Boiler Hopper Reinjection, YES/NO	YES	YES	YES	YES	YES
Economizer Hopper Reinjection, YES/NO	YES	YES	YES	YES	YES
F.D. FAN INLET AIR TEMP, °F	68	69	68	68	66
FURNACE					
Ash Bed Thickness, inches	2	2½	2	2½	2
Clinker Formation, YES/NO	NO	NO	NO	NO	NO
Visible Smoke?	NO	NO	NO	NO	NO
	Some clumps of coal (~2" diam) in furnace bed.	Burning OK			

Sheet 1 of 4

KVB

PANEL BOARD DATA SHEET
ABMA TEST SITE F

Coal Flow, lb/hr 5342.5
Steam Flow, lb/hr 60616
FW Flow, lb/hr ——
% Design Capacity 75.8
Evaporation 11.3

TEST NUMBER	35	35	35		
DATE	2-14-79	2-14-79	2-14-79		
DESCRIPTION	NORM O_2 NORM OFA	→	→		
	PARTIC.	→	→		
INTEGRATORS					
Coal Scale x 200 lbs	121124	121162	121189		
Time of Reading	16:02	17:26	18:28		
Steam Flow x 100 lbs	3033736	3034578	3035211		
Feedwater Flow x 100 lbs	O.O.S.	O.O.S.	O.O.S.		
Time of Reading	16:03	17:28	18:29		
DRAFT GAUGES					
FD Fan Pressure, "H_2O	+2.3	+2.5	+2.5		
Windbox Pressure, "H_2O	+1.0	+1.1	+1.2		
Furnace Pressure, "H_2O	-0.18	-0.18	-0.15		
Boiler Outlet Pressure, "H_2O	-0.95	-0.85	-0.85		
Economizer Outlet Pressure, "H_2O	-2.7	-2.7	-2.7		
Dust Collector Outlet Pressure, "H_2O	-6.0	-6.1	-6.1		
PRESSURE GAUGES					
Boiler Steam Pressure, psig	147	145	145		
Steam Header Pressure, psig	145	144	144		
Feedwater Header Pressure, psig	212	210	205		

Sheet 2 of 4

KVB

TEST NUMBER	35	35	35		
CHART RECORDINGS					
Steam Flow x 1000 lb/hr	60.0	60.5	61.0		
Air Flow, %	62.5	61.5	61.5		
Excess Oxygen, %	8.9	8.6	8.8		
Economizer Gas Temp Inlet, °F	540	540	540		
Economizer FW Temp Outlet, °F	311	302	310		
Economizer Gas Temp Outlet, °F	373	372	370		
Feedwater Flow x 1000 lb/hr	57	55	55		
Steam Pressure, psig	140	139	134		
Feedwater Temp, °F	220	221	220		
Feedwater Header Press, psig	205	200	195		
Opacity, %	O.O.S.	O.O.S.	O.O.S.		
CONTROLS					
Boiler Master/Stoker	54	55	55		
Fuel Air Ratio	50	50	50		
Forced Draft	59	61	63		
Furnace Draft	68	70	70		
Furnace Draft Bias	-0.15	-0.18	-0.18		
Economizer By-Pass	0	0	0		
Feedwater Flow	60	60	62		
Condensate Flow	30	30	30		
Feedwater Pressure	46	46	46		

TEST NUMBER	35	35	35		
- -					
STOKER					
Front Upper OFA Press, "H_2O	0.49 13.6	0.49 13.6	0.49 13.6		
Front Lower OFA Press, "H_2O	0.35 9.7	0.34 9.4	0.34 9.4		
Rear Upper OFA Press, "H_2O	0.05 1.4	0.05 1.4	0.05 1.4		
Rear Lower OFA Press, "H_2O	0.23 6.4	0.21 5.8	0.21 5.8		
Boiler Hopper Reinjection Pressure, "H_2O	0.22 6.1	0.21 5.8	0.22 5.8		
Econ Hopper Reinjection Pressure, "H_2O	0.30 8.3	0.31 8.6	0.31 8.6		
Overfire Air Fan Static Pressure, "H_2O	1.30 36.0	1.30 36.0	1.30 36.0		
Boiler Hopper Reinjection, YES/NO	YES	YES	YES		
Economizer Hopper Reinjection, YES/NO	YES	YES	YES		
F.D. FAN INLET AIR TEMP, OF	70	70	70		
FURNACE					
Ash Bed Thickness, inches	2½	2½	2½		
Clinker Formation, YES/NO	NO	NO	NO		
Visible Smoke?	NO	NO	NO		

SECTION 2.0

PARTICULATE DATA

PAGE

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BLR - 25.11 ft²
STACK - 12.84 ft²

PARTICULATE DATA SUMMARY
PART I

LOCATION: ABMA TEST SITE F

TEST NO.	Total Mass mgm.	Dry Gas Volume ft^3	Liquid Coll. ml.	Baro. Press. "Hg	Static Press. "H_2O	Pitot ΔP "H_2O	Orifice ΔH "H_2O	Stack Gas Temp. °R	Excess O_2 %	Sampling Time min.	Nozzle Dia. in.	Pitot Factor n.d.	Fuel Factor SCF/10^6BTU	Flue Gas MW g/g mole
05 BLR	5443.2	41.63	38.0	30.0	-2.0	0.091	0.71	770	9.4	72	.375	.837	9750	29.49
15 BLR	4770.8	28.31	32.9	29.47	-4.4	0.309	0.472	848	7.8	60	.25	.837	9871	29.47
15 MECH	1514.4	45.28	54.6	29.47	0	0.735	1.27	808	8.8	60	.25	.837	9871	29.40
17 BLR	4312.9	24.77	31.4	29.87	-4.4	0.243	0.409	849	6.7	60	.25	.837	9688	29.57
17 MECH	1246.0	37.24	73.7	29.87	0.27	0.641	0.863	850	7.7	60	.25	.837	9688	29.22
18 BLR	4534.0	22.34	31.7	29.97	-3.6	0.1983	0.308	825	5.5	60	.25	.837	10.36	29.59
18 MECH	779.2	33.10	42.1	29.97	0.20	0.500	0.705	860	6.7	60	.25	.837	10136	29.66
19 BLR	5891.5	21.09	35.1	29.92	-3.6	0.179	0.277	839	5.9	62	.25	.837	10252	29.36
19 MECH	1225.5	33.54	33.9	29.92	0.10	0.500	0.705	853	7.2	60	.25	.837	10252	29.70
20 BLR	2451.8	21.21	26.2	29.49	-2.6	0.159	0.241	818	8.4	66	.25	.837	9289	29.38
21 BLR	3832.8	24.68	32.8	28.62	-3.2	0.167	0.445	817	8.0	72	.25	.837	9624	29.33
21 MECH	1221.7	37.28	43.5	28.62	0.10	0.407	0.612	842	8.9	60	.25	.837	9624	29.42
23 BLR	4717.8	27.12	32.1	29.21	-3.6	0.203	0.3125	831	6.3	72	.25	.837	9334	29.69
23 MECH	1274.5	42.815	46.9	29.21	0.15	0.564	0.815	861	7.8	60	.25	.837	9334	29.74
24 BLR	6132.2	24.12	35.4	29.84	-3.6	0.176	0.269	830	5.0	72	.25	.837	9735	29.85
24 MECH	1252.8	37.84	43.4	29.84	0.27	0.51	0.74	853	6.5	60	.25	.837	9735	29.87
29 BLR	5214.7	24.82	43.0	29.90	-3.6	0.182	0.283	833	5.0	72	.25	.837	9768	29.60
29 MECH	1723.5	38.02	46.0	29.90	0.14	0.48	0.692	771	6.3	60	.25	.837	9768	29.66
35 BLR	3323.6	28.63	29.1	29.76	-3.0	0.165	0.296	816	8.7	72	.25	.837	9995	29.47
35 MECH	937.7	38.650	46.0	29.76	0.15	0.506	0.83	767	10.0	60	.25	.837	9995	[illegible] 5
														29.42

PARTICULATE DATA SUMMARY
PART II

Location ABMA TEST SITE F

TEST NO.	LOAD %	O_2 %	CONDITIONS	lb/10^6 Btu Corrected	EMISSIONS lb/10^6BTU	GR/SCF	LB/HR	Moisture %	Stack Gas Velocity Ft/sec	Stack Gas Flow SCF/sec	Isokin. %
5 BLR	53.8	9.4		5.076	5.113	2.009	360	4.13	20.18	348	95
15 BLR	98.8	7.8		5.926	5.895	2.638	820	5.29	39.52	604	100
15 MECH	98.8	7.8		1.329	1.322	0.547	138	5.71	59.23	491	97
17 BLR	99.1	6.7		5.510	5.585	2.708	750	5.67	34.77	538	100
17 MECH	99.1	6.7		1.130	1.145	0.516	120	8.57	56.51	452	94
18 BLR	99.1	5.5		6.136	5.945	3.125	794	6.29	30.87	494	99
18 MECH	99.1	5.5		0.771	0.747	0.362	73	5.67	49.75	395	93
19 BLR	99.1	5.9		8.785	8.414	4.309	1035	7.31	29.71	467	97
19 MECH	99.1	5.9		1.256	1.203	0.563	115	4.56	49.56	395	93
20 BLR	74.8	8.4		4.008	4.237	1.809	412	5.60	27.82	443	93
21 BLR	99.4	8.0		5.567	5.681	2.503	576	6.17	28.96	448	96
21 MECH	99.4	8.0		1.262	1.288	0.528	96	5.46	45.64	353	112
23 BLR	100.0	6.3		5.240	5.513	2.748	694	5.43	31.70	491	97
23 MECH	100.0	6.3		0.998	1.050	0.470	100	5.04	53.48	413	112
24 BLR	102.5	5.0		7.183	7.245	39.32	933	6.52	29.10	461	95
24 MECH	102.5	5.0		1.031	1.040	0.511	105	5.16	49.97	398	105
29 BLR	1005	5.0		5.944	5.975	3.243	785	7.59	29.74	471	97
29 MECH	1005	5.0		1.392	1.402	0.699	147	5.42	46.21	408	103
35 BLR	75.8	8.7		4.726	4.643	1.935	451	4.95	28.14	453	105
35 MECH	75.8	8.7		1.026	1.008	0.376	81	5.36	47.63	420	101

#15900 Rev.

PARTICULATE

DATA

Sampling Time Per Point, Min
6

Leak Check Rate

	Vac in. Hg	ft³/min
Before	15	0
After	15	0

ISOKINETICS = 92.5%

TEST NUMBER 5
DATE 12-19-78
OPERATOR H. Buening
FUEL Penn A
SITE F
PROBE LOCATION Econ. Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O₂, %	Vac.
		ΔPs	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	6min	.07	.55	100.86	310	N/A	260	211	71	85	9.4	3.0
2		.065	.51				265	210	71			3.0
3		.11	.86				270	212	70			3.0
4		.09	.71	114.15			270	210	71			3.0
5		.075	.59				250	212	72			3.0
6		.085	.67				255	212	71			3.0
7		.135	1.06				275	214	70			5.0
8		.13	1.02	129.55			275	217	73			5.0
9		.04	.31				255	212	70			3.0
10		.065	.51				270	218	72			3.0
11		.1	.79				275	220	72			4.5
12	↓	.125	.98	142.49	↓	↓	270	220	72	↓	↓	5.0
	72											
Average		.09[illegible]	0.71		310°F					85°F		

METER VOL. END 142.49
START 100.86
SAMPLE VOL. ft³

C pitot	Stack Press. In. Hg-Gauge	Barometric Pressure
.837	-2.0	30.0

Percent O₂ = 9.4

Ambient Temp. 85°F
5.27 lbs/10⁶ BTU

Nomograph Setup

P meter =
P stack =
T meter =
ΔHg =
% H₂O = 4.1

C =
T stack =
ΔP =
Noz(Ideal)=
Noz(Actual)=
V_S = 20.17 ft/sec

Imp.	Vol.(End)		Vol. (Start)		ΔVol.(ml)
#1	107	-	100	=	7
#2	121	-	100	=	21
#3	0	-	0	=	0
				Total	28
#4	g(End)		g(Start)		Δgrams
Silica Gel	210	-	200	=	10

Total Vol. H₂O 38 ml

PARTICULATE

DATA

Leak Check Rate

	Vac in. Hg	ft^3/min
Before		
After		

ISOKINETICS = 98 %

Sampling Time Per Point, Min
5

TEST NUMBER 15
DATE 1-8-79
OPERATOR
FUEL Penn A
SITE F
PROBE LOCATION Mech. Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O$_2$,%	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	5min	.44	.65	3733.29	364	120	376	173	71			
2		.62	.92	3736.68			376	214	63			
3		.81	1.20	3740.19			376	214	61			
4		.53	.79	3743.10			364	214	61			
5		.82	1.22	3747.21			364	214	63			
6		1.1	1.63	3751.06			364	213	62			
7		.60	.89	3754.37			363	214	61			
8		.83	1.23	3758.89			325	214	60			
9		1.2	1.78	3763.325			381	214	60			
10		.45	.67	3766.10			378	213	61			
11		.56	.83	3769.09			370	213	61			
12	↓	.86	1.28	3773.35	↓	↓	371	213	62			
Average		.735	1.09		364°F 824°R					70°F		

METER VOL. END 3773.35
START 3730.07
SAMPLE VOL. 43.28 ft^3

C$_{pitot}$	Stack Press. In. Hg-Gauge	Barometric Pressure
.837	0.0	29.47

Percent O$_2$ =

Nomouraph Setup

P_{meter} =
C =
P_{stack} =
T_{stack} =
T_{meter} =
ΔP =
ΔH_g =
Noz(Ideal) =
% H$_2$O = 5.7
Noz(Actual) =

V_s = 59.82 ft/sec

Imp.	Vol.(End)		Vol. (Start)		ΔVol.(ml)
#1	127	-	100	=	27
#2	116	-	100	=	16
#3	2	-	0	=	2
				Total	45
#4 Silica Gel	g(End)		g(Start)		Δgrams
	154.3	-	144.7	=	9.6
				Total Vol. H$_2$O	54.6 ml

PARTICULATE

DATA

Sampling Time Per Point, Min
5

Leak Check Rate

	Vac in. Hg	ft^3/min
Before		
After		

ISOKINETICS = 97 %

TEST NUMBER 15
DATE 1-8-79
OPERATOR
FUEL Penn A
SITE F
PROBE LOCATION Econ. Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O$_2$, %	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	1:10	.37	.56	146.25	360	330	270	160	65	85		6.0
2	1:19	.29	.45	148.55	340	330	260	180	60	85		3.0
3	1:28	.22	.32	150.50	360	340	300	160	65	85		2.5
4	1:41	.15	.23	152.15	340	340	300	160	70	90		2.0
5	2:11	.36	.55	154.71	400	270	290	150	70	85		3.0
6	2:19	.40	.61	157.45	380	320	250	160	60	90		4.0
7	2:28	.33	.50	159.90	420	330	280	170	65	90		3.0
8	2:42	.25	.38	162.00	350	330	280	150	70	90		2.0
9	3:05	.41	.64	164.80	440	280	280	150	70	90		4.0
10	3:13	.39	.60	167.45	420	360	300	210	60	90		3.0
11	3:21	.32	.49	169.75	450	400	320	210	65	90		3.0
12	2:34	.22	.34	171.71	400	330	300	160	70	90		2.0
Average		.309	.472	28.31	388°F 848°R					88°F 548°R		

METER VOL. END 171.71
START 143.40
SAMPLE VOL. 28.31 ft^3

C$_{pitot}$	Stack Press. In. Hg-Gauge	Barometric Pressure
.837	29.15	29.47

Percent O$_2$ =

Nomograph Setup

P$_{meter}$ =
P$_{stack}$ =
T$_{meter}$ =
ΔHg =
% H$_2$O = 5.1
C =
T$_{stack}$ =
ΔP =
Noz(Ideal)=
Noz(Actual)=
=

V_s = 3956

Imp.	Vol.(End)		Vol. (Start)		ΔVol.(ml)
#1	122	-	100	=	22
#2	105	-	100	=	5
#3	0	-	0	=	0
				Total	27
#4	g(End)		g(Start)		Δgrams
Silica Gel	152.7	-	146.8	=	5.9
				Total Vol. H$_2$O	32.9 ml

PARTICULATE

DATA

Leak Check Rate

	Vac in. Hg	ft^3/min
Before	15.1	.01
After	15.1	0

Sampling Time Per Point, Min
5

ISOKINETICS = 96 %

TEST NUMBER 17
DATE 1-10-79
OPERATOR
FUEL Penn A
SITE F
PROBE LOCATION Econ.Out

Sample Point	Time	METER CONDITIONS ΔP_s	ΔH	Meter Reading	TEMPERATURES, °F Stack	Probe	Oven	Impingers In	Out	Meter	O_2,%	Vac.
1	1:49	.32	.48	175.27	380	260	220	130	70	90		3.0
2	1:58	.23	.35	177.29	340	350	270	160	70	90		2.0
3	2:08	.17	.25	178.90	380	300	280	150	75	90		1.0
4	2:18	.10	.15	180.08	310	290	280	170	70	92		1.0
5	2:23	.25	.38	182.10	420	280	260	160	65	93		2.0
6	2:42	.30	.46	184.42	390	350	290	175	68	95		3.0
7	2:50	.23	.35	186.41	420	360	290	180	70	95		3.0
8	2:59	.20	.31	188.27	340	360	300	180	65	97		2.7
9	3:23	.33	.51	190.74	430	280	280	160	70	95		3.0
10	3:31	.30	.46	193.04	430	350	290	170	70	95		3.0
11	3:40	.29	.45	195.33	440	350	300	160	70	93		4.0
12	3:48	.20	.31	197.29	390	360	300	200	70	97		3.0
Average		.247	.409		849°R					553°R		

METER VOL. END 197.29
START 172.52
SAMPLE VOL. 24.77 ft^3

C_{pitot}	Stack Press. In. Hg-Gauge	Barometric Pressure
.837	-4.4" H_2O	

Percent O_2 =

Nomograph Setup

P_{meter} =
C =
P_{stack} =
T_{stack} =
T_{meter} =
ΔP =
ΔHg =
Noz(Ideal)=
% H_2O = 5.7
Noz(Actual)=

$V_s \approx 34.87$ ft/sec

Imp.	Vol.(End)		Vol. (Start)		ΔVol.(ml)
#1	122	-	100	=	22
#2	104	-	100	=	4
#3	0	-	0	=	0
				Total	26
#4 Silica Gel	g(End) 157.3	-	g(Start) 151.9	=	Δgrams 5.4
				Total Vol. H_2O	31.4 ml

PARTICULATE

DATA

Leak Check Rate

ISOKINETICS = 95.6

TEST NUMBER 17
DATE 1-10-79
OPERATOR
FUEL Penn A
SITE
PROBE LOCATION MECH Out

Sampling Time Per Point, Min
5

	Vac in. Hg	ft^3/min
Before	15	0
After	15	0

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O_2, %	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers OUT	Impingers IN	Meter		
1	5min	.27	.39	3775.75	390	280	265	65	135	70		
2		.45	.64	3778.42	395	285	285	65	155	68		
3		.67	.96	3781.71	400	300	295	60	165	70		
4		.45	.64	3784.28	390	310	305	63	170	70		
5		.68	.97	3787.83	390	310	300	63	180	70		
6		.88	1.26	3791.51	390	300	310	62	185	70		
7		.48	.69	3794.33	390	305	320	62	190	74		
8		.71	1.02	3797.85	390	305	320	62	195	74		
9		.97	1.39	3802.35	390	305	330	62	210	74		
10		.40	.57	3804.84	390	305	310	62	210	74		
11		.52	.74	3806.96	390	305	310	62	210	76		
12	↓	.76	1.09	3810.95	390	305	310	62	210	76		
Average		.641	.863		390°F 850°R					530°R		

METER VOL. END	3810.95
START	3773.71
SAMPLE VOL.	37.24 ft^3

C_{pitot}	Stack Press. ~~In. Hg Gauge~~	Barometric Pressure
.837	+.27" H_2O	29.87

Percent O_2 =

Nozzle size - .25

Nomograph Setup

P_{meter} =
P_{stack} =
T_{meter} =
ΔH_g =
% H_2O = 8.6

C =
T_{stack} =
ΔP =
Noz (Ideal) =
Noz (Actual) =

V_s = 56.34

Imp.	Vol. (End)		Vol. (Start)		ΔVol. (ml)
#1	120	-	100	=	20
#2	145	-	100	=	45
#3	0	-	0	=	0
				Total	65
#4	g (End)		g (Start)		Δgrams
Silica Gel	164.2	-	155.5	=	8.7
				Total Vol. H_2O	73.7 ml

PARTICULATE

DATA

Leak Check Rate

Vac in. Hg ft³/min

Before

After

Sampling Time Per Point, Min
5

ISOKINETICS = 95.4

TEST NUMBER 18
DATE 1-15-79
OPERATOR
FUEL Penn A
SITE F
PROBE LOCATION Econ Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O_2, %	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	15:41	.30	.46	200.30	340	300	220	150	70	80		2.0
2	13:49	.21	.33	202.21	300	330	260	180	60	85		
3	13:56	.13	.20	203.52	360	340	280	170	65	87		1.0
4	14:05	.11	.17	204.73	300	350	300	170	70	90		1.0
5	14:21	.26	.40	206.94	350	280	280	160	70	88		
6	14:31	.24	.38	209.01	370	330	300	180	70	90		2.0
7	14:41	.18	.29	210.85	420	350	310	195	70	90		2.0
8	14:50	.15	.23	212.70	320	350	320	190	70	92		1.0
9	15:11	.22	.34	214.67	410	260	290	160	70	90		2.0
10	15:19	.26	.40	216.88	400	310	300	200	65	90		3.0
11	15:28	.19	.30	218.73	420	350	310	180	70	90		2.0
12	15:37	.13	.20	220.16	390	350	320	200	70	92		1.0
Average	.1983	.308			365 °F					89 °F		

METER VOL. END 220.16
START 147.82
SAMPLE VOL. 22.34 ft³

C_{pitot}	Stack Press. In. Hg-Gauge	Barometric Pressure
.837	-3.6" H20	29.97

Percent O_2 =

Nomograph Setup

P_{meter} =
P_{stack} =
T_{meter} =
ΔH_g =
% H_2O = 6.3
V_s = 30.97

C =
T_{stack} =
ΔP =
Noz (Ideal) =
Noz (Actual) =
=

Imp.	Vol. (End)		Vol. (Start)		ΔVol. (ml)
#1	122	-	100	=	22
#2	102	-	100	=	2
#3	2	-	0	=	2
				Total	
#4	g (End)		g (Start)		Δgrams
Silica Gel	161.6	-	155.9	=	5.7

Total Vol. H_2O 31.7 ml

PARTICULATE

DATA

Leak Check Rate

Vac
in. Hg ft^3/min

ISOKINETICS = ______%

TEST NUMBER 18
DATE 1-15-79
OPERATOR
FUEL Penn A
SITE F
PROBE LOCATION Mech. out

Sampling Time Per Point, Min
5

Before
After

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O_2,%	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers OUT	Impingers IN	Meter		
1	5min	.26	.37	3820.86	385	260	255	53	55	62		
2		.35	.50	3822.98	385	270	280	53	54	65		
3		.49	.69	3825.75	390	300	305	62	190	70		
4		.37	.52	3828.47	440	340	340	60	290	69		
5		.61	.86	3831.97	410	335	350	62	290	70		
6		.86	1.21	3835.51	405	325	340	62	280	70		
7		.38	.54	3838.00	395	285	310	63	205	70		
8		.57	.81	3840.83	395	272	305	64	210	72		3.2
9		.82	1.16	3844.22	385	270	310	70	220	74		
10		.27	.38	3846.30	400	260	290	67	190	74		
11		.40	.54	3848.71	400	265	305	68	210	74		
12		.62	.88	3852.02	400	270	305	70	210	76		
Average		0.500	0.705		400°F					70°F		

METER VOL. END 3852.02
START 3818.92
SAMPLE VOL. 33.10 ft^3

C_{pitot}	Stack Press. In. Hg-Gauge	Barometric Pressure
.837		29.97

Percent O_2 =

Nomograph Setup

P_{meter} =
P_{stack} =
T_{meter} =
ΔH_g =
% H_2O = 5.7
C =
T_{stack} =
ΔP =
Noz(Ideal)=
Noz(Actual)=
=

V_s =

Imp.	Vol.(End)		Vol. (Start)		ΔVol.(ml)
#1	112	-	100	=	12
#2	117	-	100	=	17
#3	4	-	0	=	4
				Total	33
#4 Silica Gel	g(End)		g(Start)		Δgrams
	160.2	-	151.5	=	9.1

Total Vol. H_2O 42.1 ml

PARTICULATE

DATA

Sampling Time Per Point, Min
5

Leak Check Rate

	Vac in. Hg	ft^3/min
Before	15	.06
After	10	.02

ISOKINETICS = ______ %

TEST NUMBER 19
DATE 1-16-79
OPERATOR
FUEL Penn A
SITE F
PROBE LOCATION Econ. Out

Sample Point	Time PM	METER CONDITIONS			TEMPERATURES, °F						O$_2$, %	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	9:06	.13	.20	236.06	320	340	310	180	80	85		1.0
2	9:14	.19	.29	237.80	340	330	310	180	70	85		1.5
3	9:22	.13	.20	239.18	380	340	310	190	70	88		1.0
4	9:30	.10	.15	240.33	310	360	300	190	75	90		1.0
5	9:49	.22	.34	242.32	420	260	280	170	78	90		1.5
6	9:57	.25	.39	244.41	390	340	00	180	70	90		2.0
7	10:05	.21	.33	246.36	440	350	290	190	68	93		2.5
8	10:14	.14	.22		330	350	300	190	80	95		1.0
9	10:41	.19	.30	250.25	410	310	290	160	75	90		1.5
10	10:50	.23	.35	252.27	400	340	300	190	70	90		2.0
11	10:57	.22	.34	254.20	420	350	300	200	70	93		2.0
12	11:05	.14	.21	255.65	390.	350	310	200	70	9		2.0
	62											
Average		0.179	0.277		379°F					90°F		

METER VOL. END 255.65
START 234.56
SAMPLE VOL. ft^3

C$_{pitot}$	Stack Press. ~~In. Hg Gauge~~	Barometric Pressure
.837	-.36"H$_2$O	29.92

Percent O$_2$ =

Nomograph Setup

P$_{meter}$ =
P$_{stack}$ =
T$_{meter}$ =
ΔH_g =
% H$_2$O = 7.3
C =
T$_{stack}$ =
ΔP =
Noz(Ideal)=
Noz(Actual)=
=

Imp.	Vol.(End)		Vol. (Start)		ΔVol.(ml)
#1	112	-	100	=	12
#2	105	-	100	=	5
#3	2	-	0	=	2
				Total	19
#4 Silica Gel	g(End)		g(Start)		Δgrams
	173.4	-	157.3	=	16.1
				Total Vol. H$_2$O	35.1 ml

PARTICULATE

DATA

Sampling Time Per Point, Min
5

Leak Check Rate

	Vac in. Hg	ft^3/min
Before		
After		

ISOKINETICS = ______ %

TEST NUMBER 19
DATE 1-16-79
OPERATOR
FUEL Penn A
SITE F
PROBE LOCATION Mech. Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O$_2$, %	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	5 min	.26	.37	3857.28	385	260	305	60	170	61		
2		.35	.50	3859.73	390	260	300	60	190	62		
3		.49	.69	3862.43	390	285	300	60	190	64		
4		.37	.52	3864.34	390	260	305	62	200	60		
5		.61	.86	3867.58	390	270	305	60	210	65		
6		.86	1.21	3871.24	370	290	305	60	215	65		
7		.38	.54	3873.53	395	295	310	62	215	70		
8		.57	.81	3876.52	395	255	312	62	225	70		
9		.82	1.16	3880.35	395	300	300	62	235	72		
10		.27	.38	3882.22	395	280	300	62	220	75		
11		.40	.54	3885.15	395	280	305	62	220	75		
12	↓	.62	.88	3888.59	400	305	310	62	225	74		
Average		0.500	0.705		3934					68°F		

METER VOL. END 3888.59
START 3855.05
SAMPLE VOL. 33.54 ft^3

C$_{pitot}$	Stack Press. In. Hg-Gauge	Barometric Pressure
0.837	+ 0.10	29.92

Percent O$_2$ =

Nomograph Setup

P$_{meter}$ =
P$_{stack}$ =
T$_{meter}$ =
ΔHg =
% H$_2$O =

C =
T$_{stack}$ =
ΔP =
Noz(Ideal) =
Noz(Actual) =

Imp.	Vol. (End)		Vol. (Start)		ΔVol. (ml)
#1	45	-	100	=	} 25
#2	180	-	100	=	
#3	0	-	0	=	0
				Total	25
#4	g(End)		g(Start)		Δgrams
Silica Gel	164.4	-	155.5	=	8.9
				Total Vol. H$_2$O	33.9 ml

Ambient Air Temp. 30°F

PARTICULATE

DATA

Sampling Time Per Point, Min
6

Leak Check Rate

	Vac in. Hg	ft^3/min
Before	.01	10
After		

ISOKINETICS = ________ %

TEST NUMBER 20
DATE 1-17-79
OPERATOR ________
FUEL Penn A
SITE F
PROBE LOCATION Econ Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O_2, %	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	4:03	.12	.18	258.00	290	320	240	150	70	82		.5
2	4:11	.10	.15	259.47	300	320	260	160	70	84		.3
3	4:20	.08	.12	260.65	340	360	270	160	70	85		.3
4	—	.06	<.10	—— unable to sample ——								
5	4:50	.18	.28	262.76	380	250	270	170	70	88		1.0
6	4:59	.22	.32	265.21	360	360	290	170	68	90		1.5
7	5:08	.17	.26	267.27	400	360	300	180	68	91		1.0
8	5:19	.14	.21	269.23	300	340	240	160	70	91		1.0
9	5:40	.21	.32	271.56	400	250	270	160	70	90		1.5
10	5:48	.21	.32	273.97	390	300	280	180	68	92		2.0
11	5:57	.18	.28	275.97	400	340	260	170	70	95		2.0
12	6:06	.14	.21	277.82	380	340	270	160	70	97		1.5
	66											
Average		0.159	0.241		358°F					90°F		

METER VOL.	
END	277.82
START	256.61
SAMPLE VOL.	21.21 ft^3

C_{pitot}	Stack Press. ~~in. Hg Gauge~~	Barometric Pressure
.837	-2.6" H_2O	29.49

Percent O_2 = 8.4

Nomograph Setup

P_{meter} =
P_{stack} =
T_{meter} =
ΔH_g =
% H_2O = 5.6
C =
T_{stack} =
ΔP =
Noz(Ideal) =
Noz(Actual) =
=

Imp.	Vol. (End)		Vol. (Start)		ΔVol. (ml)
#1	118	-	100	=	18
#2	103	-	100	=	3
#3	0	-	0	=	0
				Total	21

#4	g(End)		g(Start)		Δgrams
Silica Gel	161.4	-	156.2	=	5.2

Total Vol. H_2O 26.2 ml

PARTICULATE

DATA

Sampling Time Per Point, Min
6

Leak Check Rate

	Vac in. Hg	ft^3/min
Before	.16	0.02
After		

ISOKINETICS = 93 %

TEST NUMBER 21

DATE 1-2-79

OPERATOR

FUEL Penn A

SITE F

PROBE LOCATION Econ. out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O$_2$, %	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	10:26	.20	.34	281.78	330	320	260	170	70	80		2.0
2	10:38	.15	.25	283.67	300	320	280	180	70	83		1.0
3	10:48	.12	.20	285.42	340	340	280	160	70	85		1.0
4	10:57	.08	.13	286.55	300	340	280	180	70	87		.5
5	11:19	.22	.37	288.97	400	260	260	170	68	90		2.0
6	11:29	.22	.37	291.55	360	300	260	170	70	90		2.0
7	11:38	.16	.27	293.54	400	330	280	170	68	90		1.0
8	11:48	.13	.22	295.46	300	340	300	180	70	92		1.0
9	12:13	.23	.38	298.01	400	280	300	170	75	90		2.0
10	12:22	.20	.33	300.36	390	310	310	200	70	90		2.0
11	12:31	.18	.30	302.52	400	340	310	210	70	93		1.0
12	12:41	.11	.18	304.17	360	300	300	180	72	95		.5
Average		.167	.445		357°F					89°F		

METER VOL.	
END	304.17
START	279.49
SAMPLE VOL.	24.68 ft^3

C$_{pitot}$	Stack Press. ~~in. Hg Gauge~~	Barometric Pressure
.837	-3.2 "H$_2$O	28.62

Percent O$_2$ =

Nomograph Setup

P_{meter} =

P_{stack} =

T_{meter} =

$\Delta H_@$ =

% H_2O = 6.2

V_S = 28.93

γ = 1.12

C =

T_{stack} =

ΔP =

Noz(Ideal)=

Noz(Actual)=

Imp.	Vol.(End)		Vol. (Start)		ΔVol.(ml)
#1	127	-	100	=	27
#2	98	-	100	=	-2
#3	0	-	0	=	0
				Total	25
#4 Silica Gel	g(End) 160.8	-	g(Start) 153.0	=	Δgrams 7.8
				Total Vol. H$_2$O	32.8 ml

PARTICULATE

DATA

Sampling Time Per Point, Min
5

Leak Check Rate

	Vac in. Hg	ft^3/min
Before		
After		

ISOKINETICS = 112.

TEST NUMBER 21
DATE 2-1-79
OPERATOR
FUEL Penn A
SITE F
PROBE LOCATION Mech, Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O_2,%	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	5min	0.13	0.20	3910.29	375	250	220	70	105	70		1.0
2		0.37	0.56	3913.84	375	270	270	70	170	70		4.0
3		0.58	0.87	3918.05	375	275	290	70	175	70		6.0
4		0.22	0.33	3919.85	375	275	310	70	180	74		1.0
5		0.49	0.74	3923.59	375	280	320	72	220	75		5.5
6		0.72	1.08	3927.93	380	280	320	75	220	78		10.0
7		0.20	0.30	3930.04	385	285	330	75	220	75		2.0
8		0.40	0.60	3933.52	390	290	320	75	220	80		5.0
9		0.67	1.01	3937.86	390	290	325	75	230	80		8.4
10		0.17	0.26	3939.90	390	285	315	75	215	84		1.0
11		0.33	0.50	3942.49	390	285	320	75	215	84		4.5
12		0.60	0.90	3946.39	390	290	320	75	215	85		7.8
Average		.407	.612		382°F					77°F		

METER VOL. END 3946.39
START 3909.11
SAMPLE VOL. 37.28 ft^3

C_{pitot}	Stack Press. in H_2O ~~In. Hg Gauge~~	Barometric Pressure
.837	+0.10	28.62

Percent O_2 =

Nomograph Setup

P_{meter} =
P_{stack} =
T_{meter} =
ΔH_g =
% H_2O = 5.5

C =
T_{stack} =
ΔP =
Noz(Ideal) =
Noz(Actual) =

V_s = 45.65 ft/sec

Imp.	Vol.(End)		Vol. (Start)		ΔVol.(ml)
#1	120	-	100	=	20
#2	112	-	100	=	12
#3	0	-	0	=	0
				Total	
#4	g(End)		g(Start)		Δgrams
Silica Gel	161.0	-	149.5	=	11.5
				Total Vol. H_2O	43.5 ml

PARTICULATE

DATA

Leak Check Rate

Sampling Time Per Point, Min
6

	Vac in. Hg	ft^3/min
Before		
After		

ISOKINETICS = ______ %

TEST NUMBER 23
DATE 2-1-79
OPERATOR JEC
FUEL Penn A
SITE F
PROBE LOCATION Econ Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O$_2$,%	Vac.
		ΔP$_s$	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	2:27	.25	.38	310.31	350	220	200	140	70	80		2.0
2	2:37	.19	.29	312.33	360	380	280	160	65	82		1.0
3	2:47	.14	.21	314.14	330	320	290	170	70	87		1.0
4	2:51	.10	.16	315.57	310	340	300	180	70	90		1.0
5	3:14	.23	.35	317.89	400	260	270	160	70	90		2.0
6	3:30	.23	.35	320.45	380	360	280	160	70	90		2.0
7	3:41	.22	.34	322.68	410	350	300	190	65	92		2.0
8	3:52	.20	.31	325.05	340	350	290	200	60	90		2.0
9	4:12	.22	.34	327.40	400	270	380	170	70	90		2.5
10	4:27	.27	.42	330.08	380	330	290	190	70	90		3.0
11	4:37	.21	.32	332.43	420	350	290	180	68	90		2.0
12	4:47	.18	.28	334.44	390	350	300	170	68	90		1.0
Average		0.203	0.3125		371°F					88°F		

METER VOL. END 334.44
START 307.32
SAMPLE VOL. 27.12 ft^3

C$_{pitot}$	Stack Press. ~~In. Hg Gauge~~	Barometric Pressure
.837	-3.6 "H$_2$O	29.21

Percent O$_2$ =

Nomograph Setup

P$_{meter}$ =
P$_{stack}$ =
T$_{meter}$ =
ΔHg =
% H$_2$O = 5.4
C =
T$_{stack}$ =
ΔP =
Noz(Ideal)=
Noz(Actual)=

Imp.	Vol.(End)		Vol. (Start)		ΔVol.(ml)
#1	122	-	100	=	22
#2	104	-	100	=	4
#3	0	-	0	=	0
				Total	
#4 Silica Gel	g(End) 157.2	-	g(Start) 151.1	=	Δgrams 32.1

Total Vol. H$_2$O 32.1 ml

PARTICULATE

DATA

Leak Check Rate

	Vac in. Hg	ft^3/min
Before		
After		

ISOKINETICS** = ______ %

Sampling Time Per Point, Min
5

TEST NUMBER 23
DATE 2-1-79
OPERATOR
FUEL Penn/A
SITE F
PROBE LOCATION Mech Dust Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O_2, %	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers		Meter		
1	5min	.26	.38	3951.53	405	280	270	70	100	60		1.0
2		.48	.70	3954.78	405	280	270	70	105	60		5.5
3		.58	.85	3958.61	405	260	270	70	120	65		6.0
4		.42	.61	3961.84	405	270	280	65	130	65		5.0
5		.66	.95	3965.36	405	270	280	65	135	65		7.2
6		.87	1.2	3969.21	405	270	280	65	150	65		10.0
7		.45	.64	3972.21	405	270	280	65	170	70		5.5
8		.72	1.03	3976.30	405	270	280	69	185	70		8.0
9		.86	1.23	3980.71	390	275	300	69	180	70		10.2
10		.33	.46	3983.42	395	275	305	65	175	72		4.0
11		.43	.63	3986.39	390	280	310	70	180	72		5.2
12	↓	.76	1.1	3990.285	400	280	320	70	190	72		9.0
Average		0.564	0.815		401°F					67°F		

METER VOL. END 3990.285
START 3947.47
SAMPLE VOL. 42.815 ft^3

C_{pitot}	Stack Press. ~~In Hg Gauge~~	Barometric Pressure
.837	4.15" H_2O	29.21

Percent O_2 =

Nomograph Setup

P_{meter} =
P_{stack} =
T_{meter} =
ΔH_g =
% H_2O = 5.0
C =
T_{stack} =
ΔP =
Noz (Ideal) =
Noz (Actual) =
=

Imp.	Vol. (End)		Vol. (Start)		ΔVol. (ml)
#1	117	-	100	=	17
#2	116	-	100	=	16
#3	3	-	0	=	3
				Total	36
#4	g (End)		g (Start)		Δgrams
Silica Gel	160.6	-	149.7	=	10.9
				Total Vol. H_2O	46.9 ml

Ambient Air Temp 24°F

PARTICULATE

DATA

Leak Check Rate

	Vac in. Hg	ft^3/min
Before	15.	0.00
After		

Sampling Time Per Point, Min
6

ISOKINETICS = 91.2%

TEST NUMBER 24
DATE 2-6-79
OPERATOR
FUEL Penn A
SITE F
PROBE LOCATION Econ Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES °F						O_2,%	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	2:46	.28	.43	337.59	350	340	250	170	70	83		2.5
2	2:55	.14	.29	339.62	340	340	350	190	68	85		2.0
3	3:04	.12	.17	341.18	340	350	330	190	70	88		1.0
4	3:13	.09	.14	342.46	300	370	310	190	70	90		1.0
5	3:22	.21	.32	344.70	390	—	—	160	70	90		2.0
6	3:43	.24	.37	347.14	380	310	280	160	70	90		2.0
7	3:52	.17	.26	349.13	430	340	290	180	68	92		1.5
8	4:03	.16	.25	351.02	320	350	300	180	70	93		1.5
9	4:30	.17	.26	353.07	400			170	70	90		1.5
10	4:39	.15	.23	354.94	400	360	280	190	70	90		1.0
11	4:48	.18	.28	357.01	410	350	300	190	68	92		2.0
12	4:58	.15	.23	358.90	380	350	300	170	70	95		1.0
Average		0.176	0.269		370°F					90°F		

METER VOL. END 358.90
START 334.78
SAMPLE VOL. 24.12 ft^3

C_{pitot}	Stack Press. ~~In. Hg Gauge~~	Barometric Pressure
.837	-3.6" H_2O	29.84

Percent O_2 =

Ambient Temp. 12°F

Nomograph Setup

P_{meter} =
T_{stack} =
T_{meter} =
ΔH_g =
% H_2O = 5.4
v_s = 29.32

C =
T_{stack} =
ΔP =
Noz(Ideal) =
Noz(Actual) =

Imp.	Vol.(End)		Vol. (Start)		ΔVol.(ml)
#1	125	-	100	=	25
#2	105	-	100	=	5
#3	0	-	0	=	0
				Total	30
#4	g(End)		g(Start)		Δgrams
Silica Gel	155.4	-	150.0	=	5.4
				Total Vol. H_2O	35.4 ml

PARTICULATE

DATA

Sampling Time Per Point, Min
5

Leak Check Rate

	Vac in. Hg	ft^3/min
Before		
After		

ISOKINETICS = 104.

TEST NUMBER 24
DATE 2-6-79
OPERATOR
FUEL Penn. A
SITE F
PROBE LOCATION Main Dust Collector Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O$_2$,%	Vac.
		ΔP$_s$	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	5min	.25	.37	3994.96	392	300	280	62	145	65		1.3
2		.45	.65	3998.13	393	290	290	62	155	65		4.0
3		.57	.83	4001.55	393	300	310	64	190	66		5.1
4		.37	.54	4004.21	395	300	290	66	165	70		3.0
5		.60	.87	4007.62	395	303	300	68	200	70		6.0
6		.76	1.1	4011.43	395	305	320	68	150	72		7.0
7		.42	.61	4014.29	390	310	330	70	210	74		4.3
8		.66	.95	4017.14	395	270	320	70	230	74		7.0
9		.73	1.05	4022.23	390	280	315	72	240	76		8.2
10		.24	.35	4024.03	390	315	325	74	225	77		2.5
11		.40	.57	4026.68	395	303	330	72	210	76		6.0
12	↓	.65	.95	4030.06	395	305	330	72	215	76		7.2
Average		0.51	0.74		393°F					72°F		

METER VOL.	
END	4030.06
START	3992.22
SAMPLE VOL.	3784 ft^3

C$_{pitot}$	Stack Press. ~~in. Hg Gauge~~	Barometric Pressure
.837	+.27"H$_2$O	29.84

Percent O$_2$ =

Ambient Temp. 12°F

Nomograph Setup

P$_{meter}$ =
C =
P$_{stack}$ =
T$_{stack}$ =
T$_{meter}$ =
ΔP =
ΔH$_@$ =
Noz(Ideal) =
% H$_2$O = 5.2
Noz(Actual) =

$V_s = 50.36$

Imp.	Vol. (End)		Vol. (Start)		ΔVol. (ml)
#1	107	-	100	=	7
#2	120	-	100	=	20
#3	6	-	0	=	6
				Total	33
#4	g(End)		g(Start)		Δgrams
Silica Gel	161.4	-	151.0	=	10.4

Total Vol. H$_2$O 43.4 ml

PARTICULATE

DATA

Leak Check Rate

Sampling Time Per Point, Min
6

	Vac in. Hg	ft^3/min
Before		
After		

ISOKINETICS = 93 %

TEST NUMBER 29
DATE 2-12-79
OPERATOR
FUEL Penn. B
SITE F
PROBE LOCATION Econ. out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O_2,%	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers		Meter		
								In	Out			
1	5:55	.27	.41	362.32	350	300	280	140	70	76		2.0
2	6:04	.16	.25	364.37	320	320	300	160	60	80		1.5
3	6:13	.12	.19	365.86	350	340	300	160	70	82		1.0
4	6:22	.095	.15	367.20	310	340	300	170	70	85		<1
5	6:38	.21	.32	369.46	420	340	300	170	70	87		2.0
6	6:46	.21	.32	372.66	400	340	300	190	67	89		2.0
7	6:55	.17	.27	373.63	420	340	310	190	70	90		2.0
8	7:05	.16	.25	375.61	350	340	310	190	70	90		1.5
9	7:14	.19	.30	377.76	400	340	310	190	70	90		2.0
10	7:27	.21	.32	380.09	405	340	300	180	70	90		2.5
11	7:35	.22	.35	382.42	400	340	300	180	65	90		3.0
12	7:44	.17	.27	384.45	370	340	300	180	70	90		2.0
Average		0.182	0.283		373°F					87°F		

METER VOL. END 384.45
START 359.63
SAMPLE VOL. 24.82 ft^3

C_{pitot}	Stack Press. In. Hg-Gauge	Barometric Pressure
.837	-3.6 "H_2O	29.90

Percent O_2 =

Nomograph Setup

P_{meter} =
C =
P_{stack} =
T_{stack} =
T_{meter} =
ΔF =
ΔHg =
Noz(Ideal)=
% H_2O = 6.0
Noz(Actual)=

V_s = 29.66 ft/sec

Y = 1.19

Imp.	Vol. (End)		Vol. (Start)		ΔVol. (ml)
#1	124	-	100	=	24
#2	108	-	100	=	8
#3	5	-	0	=	5
				Total	37
#4 Silica Gel	g(End) 160.0	-	g(Start) 154.0	=	Δgrams 6
				Total Vol. H_2O	43 ml

PARTICULATE

DATA

Sampling Time Per Point, Min
5

Leak Check Rate

	Vac in. Hg	ft^3/min
Before		
After		

ISOKINETICS = 103 %

TEST NUMBER 29

DATE 2-12-79

OPERATOR

FUEL Penn. B

SITE F

PROBE LOCATION Mech Dust Collector Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O_2,%	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers OUT	Impingers IN	Meter		
1	5min	.20	.29	4032.45	340	275	290	55	165	50		1.0
2		.38	.55	4035.27	340	300	300	55	180	55		2.0
3		.54	.79	4038.98	300	300	305	55	215	55		5.0
4		.33	.47	4042.30	300	300	305	55	210	55		3.0
5		.54	.78	4045.56	310	300	320	55	210	58		5.0
6		.75	1.09	4049.86	305	290	315	55	200	58		6.5
7		.35	.50	4052.62	300	275	315	55	190	60		3.0
8		.60	.86	4056.31	305	275	315	55	260	60		6.0
9		.76	1.1	4059.63	305	275	315	55	210	62		6.4
10		.30	.43	4061.52	310	280	320	55	190	62		2.0
11		.38	.55	4064.50	310	280	320	55	190	62		2.5
12	↓	.62	.90	4068.10	310	280	320	55	190	62		6.0
Average		0.48	0.692		311°F					58°F		

METER VOL. END 4068.10

START 4030.08

SAMPLE VOL. ft^3

C_{pitot}	Stack Press. ~~in. Hg~~ Gauge	Barometric Pressure
.837	.14" H_2O	29.90

Percent O_2 =

Nomograph Setup

P_{meter} =

C =

T_{stack} =

T_{stack} =

T_{meter} =

ΔP =

ΔHg =

Noz(Ideal) =

% H_2O = 5.4

Noz(Actual) =

=

V_S ≈ 46.41 ft/sec

Imp.	Vol. (End)		Vol. (Start)		ΔVol. (ml)
#1	118ml	-	100ml	=	18
#2	119	-	100	=	19
#3	1	-	0	=	1
				Total	
#4	g(End)		g(Start)		Δgrams
Silica (g)	160.85	-	152.8	=	8.05

Total Vol. H_2O 46.05ml

PARTICULATE

DATA

Sampling Time Per Point, Min
6

Leak Check Rate

	Vac in. Hg	ft^3/min
Before		
After		

ISOKINETICS = 100.5

TEST NUMBER 35
DATE 2-14-79
OPERATOR
FUEL Penn. 8
SITE F
PROBE LOCATION Econ. Out

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F							O$_2$,%	Vac.
		ΔP$_s$	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter			
Port #1 1	15:54	.21		386, 57	343	320	270	180	—	89	90		
2		.17		388, 62	309	320	290	180	—	89	92		
3		.11		390, 10	330	330	310	180	—	90	77		1.0
4		.09		391, 28	300	330	305	185	—	92	98		1.0
Port #2 1		.20	.34	393.50	355	270	270	190	62	92	95		2.0
2		.22	.37	395.95	350	280	285	190	62	92	97		2.0
3		.17	.34	398.88	410	310	300	190	63	93	97		2.0
4		.16	.30	401.88	310	310	310	192	67	93	98		2.0
Port #3 1		.15	.28	404.15	395	315	280	192	68	92	98		2.0
2		.195	.36	406.68	390	300	305	190	65	92	98		2.4
3		.17	.32	409.18	420	300	310	190	63	92	98		2.3
4		.135	.25	411.439	365	305	310	190	67	93	98		2.0
Average		0.165	0.296		356°F					96°F			

METER VOL. END 411.439
START 384.81
SAMPLE VOL. ft^3

C$_{pitot}$	Stack Press. In. Hg-Gauge	Barometric Pressure
.837	-3.0" H$_2$O	29.76

Percent O$_2$ =

Nomograph Setup

P$_{meter}$ =
C =
P$_{stack}$ =
T$_{stack}$ =
T$_{meter}$ =
ΔP =
ΔH$_g$ =
Noz(Ideal) =
% H$_2$O = 4.9
Noz(Actual) =

Imp.	Vol.(End)	Vol. (Start)	ΔVol.(ml)
#1	122	100	22
#2	102	100	2
#3	0	0	0
		Total	24
#4 Silica Gel	g(End) 156.4	g(Start) 151.3	Δgrams 5.1
		Total Vol. H$_2$O	29.1 ml

PARTICULATE

DATA

Sampling Time Per Point, Min
5

Leak Check Rate

	Vac in. Hg	ft^3/min
Before		
After		

ISOKINETICS = 101.3%

TEST NUMBER 35
DATE 2-14-79
OPERATOR M. G. Gabriel
FUEL Penn. B
SITE F
PROBE LOCATION Mech Dust Collect

Sample Point	Time	METER CONDITIONS			TEMPERATURES, °F						O$_2$, %	Vac.
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	Impingers In	Impingers Out	Meter		
1	5 min	.23	.37	4089.70	310	305	300	55	155	62		1.0
2		.50	.82	4093.06	295	310	300	55	165	62		3.5
3		.58	.95	4096.53	280	305	305	62	190	62		4.2
4		.40	.65	4099.57	310	320	320	64	200	70		3.0
5		.65	1.07	4103.33	305	307	320	66	225	72		5.4
6		.78	1.28	4107.32	305	310	325	68	230	72		7.0
7		.36	.59	4109.92	310	310	325	65	235	75		1.5
8		.58	.96	4113.46	307	305	305	65	240	75		4.5
9		.73	1.18	4117.20	310	305	310	65	220	73		6.4
10		.25	.41	4119.57	320	310	320	65	220	73		1.0
11		.38	.62	4122.50	316	300	320	60	220	73		2.0
12	↓	.64	1.05	4126.28	316	300	325	60	220	72		5.0
Average		0.506	0.83		307°F					70°F		

METER VOL. END 4126.28
START 4087.63
SAMPLE VOL. 38.65 ft^3

C$_{pitot}$	Stack Press. ~~in. Hg Gauge~~	Barometric Pressure
.837	.15" H$_2$O	29.76

Percent O$_2$ =

Nomograph Setup

P$_{meter}$ = C =
P$_{stack}$ = T$_{stack}$ =
T$_{meter}$ = ΔP =
ΔH$_g$ = Hoz(Ideal)=
% H$_2$O = 5.3 Hoz(Actual)=

$v_s = 47.64$ ft/sec

Imp.	Vol. (End)		Vol. (Start)		ΔVol. (ml)
#1	109	-	100	=	9
#2	122	-	100	=	22
#3	5	-	0	=	5
				Total	36
#4	g(End)		g(Start)		Δgrams
Silica Gel	160.02	-	150	=	10
				Total Vol. H$_2$O	46 ml

PARTICULATE LAB WORKSHEET

TEST NO. 5 (~~Inlet~~, Blr. Outlet) LOCATION ABMA site F

Date 12·19·78 Box No. ____ Eng. ks.

Test Description Baseline Partic. @ 45 K lbs/Hr.

Dry Gas Meter Vol (ft^3)
Final 142.49
Initial 100.86
Δ DgV 41.63

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial	See	accompanying		data
Δ Vlc		sheet		

CONTENT		H$_2$O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	Acetone Blank No.
BOTTLE NO.			1	1	1	2	200 ml
BEAKER NO.			1				6
DATE WT.			12-18-78	12-19-78	12-18-78	12-18-78	12-18-78
TARE WT.	1		100.0747	60.5214	.8404	.8455	100.4806
	2		100.0743	60.5213	.8400	.8458	100.4809
	3		100.0747	60.5210	.8399	.8458	100.4811
	4						
AVG.			100.0746	60.5212	.8401	.8457	100.4809

200 ml 150 ml POST TEST WTS.

	1		100.1189	65.7562	1.0119	.8454	100.4858
	2		100.1192	65.7559	1.0117	.8456	100.4855
	3		100.1193	65.7561	1.0116	.8455	100.4853
	4						
AVG.			100.1191	65.7561	1.0117	.8455	100.4855
Δ WT.			0.0445	5.2349	0.1716	-.0002	+ 0.0046

Δ Vlc = 38 ml LOAD 45 klb/hr

Δ DgV = 41.63 ft^3 O$_2$ 9.4 %

Δ Mn 5.4432 gm REMARKS: ____

PARTICULATE LAB WORKSHEET

TEST NO. 15 Econ Out (~~Inlet, Outlet~~)　　LOCATION ABMA Site F

Date 1/8/79　　Box No._______　　Eng._______

Test Description_______

Dry Gas Meter Vol (ft^3)

Final_______

Initial_______

Δ DgV_______

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					3		
BEAKER NO.			5	4			
DATE WT.			12-18-78	12-19-78	12-18-78		
TARE WT.	1		99.9246	100.7865	.8550		
	2		99.9250	100.7861	.8551		
	3		99.9251	100.7863	.8551		
	4						
AVG.			99.9249	100.7863	.8551		
POST TEST WTS.							
	1		100.0065	105.2943	01.0364		
	2		100.0063	105.2946	01.0363		
	3		100.0061	105.2945	01.0361		
	4						
AVG.			100.0063	105.2945	01.0363		
Δ WT.			0.0814	4.5082	0.1812		

Δ Vlc = 32.9 ml　　LOAD 80 klb/hr

Δ DgV = 28.31 ft^3　　O_2 7.8 %

Δ Mn 4770.8 mgm　　REMARKS:_______

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 15 Mech. Out (~~Inlet, Outlet~~) LOCATION F

Date 1/8/79 Box No. ____ Eng. ____

Test Description ____

Dry Gas Meter Vol (ft^3)

Final ____

Initial ____

Δ DgV ____

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY ~~FLASK~~	FILTER NO.	BLANK NO.	
BOTTLE NO.			2	2	4		
BEAKER NO.							
DATE WT.			1-4-79	1-4-79	12-18-78		
TARE WT.	1		100.6053	78.8320	.8303		
	2		100.6054	78.8315	.8303		
	3		100.6051	78.8316	.8301		
	4						
AVG.			100.6052	78.8318	.8302		

POST TEST WTS.

	1		100.9373	79.5974	01.2473		
	2		100.9372	79.5971	01.2471		
	3		100.9372	79.5970	01.2470		
	4						
AVG.			100.9372	79.5972	01.2471		
Δ WT.			0.3321	0.7654	0.4169		

Δ Vlc = 54.6 ml

Δ DgV = 43.28 ft^3

Δ Mn 1514.4 mgm

LOAD 80 klb/hr

O_2 8.8 %

REMARKS: ____

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 17 econ O~~(Inlet, Outl~~et)   LOCATION ABMA SITE F

Date 1/10/29   Box No. ________   Eng. ________

Test Description ________

Dry Gas Meter Vol (ft^3)
Final ________
Initial ________
Δ DgV ________

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE Beaker	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.			14		6		
BEAKER NO.				6			
DATE WT.				1/6/78	1/6/78		
TARE WT.	1		98.7403	100.4817	.8424		
	2		98.7403	100.4817	8422		
	3		98.7405	100.4819	.8421		
	4						
AVG.			98.7404	100.4818	.8422		
POST TEST WTS.							
	1		98.8415	104.5236	1.0420		
	2		98.8414	104.5239	1.0421		
	3		98.8413	104.5240	1.0422		
	4						
AVG.			98.8414	104.5238	1.0421		
Δ WT.			0.101	4.042	0.1999		

Δ Vlc = 31.4 ml   LOAD 80 klb/hr

Δ DgV = 24.77 ft^3 O_2 6.7 %

Δ Mn 4342.9 mgm   REMARKS: ________

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 17 mech OUT ~~(Inlet, Outlet)~~ LOCATION ABMA STIP F

Date 1/11/79 Box No. Eng.

Test Description

Dry Gas Meter Vol (ft^3)

Final

Initial

Δ DgV

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE Beaker	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.			15		7		
BEAKER NO.				8			
DATE WT.				1/6/78	1/6/78		
TARE WT.	1		101.4234	99.3337	.8240		
	2		101.4236	99.3339	.8238		
	3		101.4238	99.3340	.8239		
	4						
AVG.			101.4236	99.3339	.8239		

POST TEST WTS.

1		101.8965	99.7519	1.1788		
2		101.8966	99.7516	1.1791		
3		101.8969	99.7514	1.1793		
4						
AVG.		101.8967	99.7516	1.1791		
Δ WT.		0.4731	0.4177	0.3552		

Δ Vlc = 73.7 ml LOAD 80 klb/hr

Δ DgV = 37.24 ft^3 O_2 7.7 %

Δ Mn 1246. mgm REMARKS:

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 18 (Inlet, Outlet) LOCATION Economizer Outlet

Date 1-15-79 Box No. ______ Eng. Tidona

Test Description ______

Dry Gas Meter Vol (ft^3)

Final ______

Initial ______

Δ DgV ______

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					8		
BEAKER NO.			#30	#5			
DATE WT.			1-13-79	1-13-79	1-13-79		
TARE WT.	1		103.1102	99.9247	.8290		
	2		103.1099	99.9245	.8289		
	3		103.1098	99.9243	.8290		
	4						
AVG.			103.1100	99.9245	.8290		

POST TEST WTS.

	1		103.4726	103.9080	1.0173		
	2		103.4723	103.9078	1.0175		
	3		103.4724	103.9077	1.0170		
	4						
AVG.			103.4724	103.9078	1.0173		
Δ WT.			.3624	3.9833	.1883		

Δ Vlc = 31.7 ml

Δ DgV = 22.34 ft^3

Δ Mn 4534.0 mgm

LOAD 80 klb/hr

O_2 5.5 %

REMARKS: ______

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 18 (Inlet, Outlet) LOCATION Mech. Dust Collect. Outlet

Date 1-15-79 Box No. ________ Eng. ________

Test Description ________

Dry Gas Meter Vol (ft^3)

Final ________

Initial ________

Δ DgV ________

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					9		
BEAKER NO.			#10	#1			
DATE WT.			1-13-79	1-13-79	1-13-79		
TARE WT.	1		100.9350	100.0748	.8467		
	2		100.9346	100.0746	.8468		
	3		100.9344	100.0745	.8466		
	4						
AVG.			100.9347	100.0746	.8467		

POST TEST WTS.

	1		101.0635	100.4027	1.1696		
	2		101.0630	100.4022	1.1694		
	3		101.0631	100.4023	1.1699		
	4						
AVG.			101.0632	100.4024	1.1696		
Δ WT.			.1285	.3278	.3229		

Δ Vlc = 42.1 ml

Δ DgV = 33.10 ft^3

Δ Mn 779.2 mgm

LOAD 80 klb/hr

O_2 6.7 %

REMARKS: ________

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 19 econ out (~~Inlet, Outlet~~) LOCATION ABMA Site F

Date 1/16/79 Box No. ______ Eng. ______

Test Description ______

Dry Gas Meter Vol (ft^3)
Final ______
Initial ______
Δ DgV ______

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					2		
BEAKER NO.			16	2			
DATE WT.			1-17-79	1-16-79	12-20-78		
TARE WT.	1		98.7370	100.6050	.8455		
	2		98.7368	100.6052	.8458		
	3		98.7367	100.6048	.8458		
	4						
AVG.			98.7368	100.6050	0.8457		
POST TEST WTS.							
	1		98.8990	106.1080	1.0788		
	2		98.8967	106.1041	1.0784		
	3		98.8965	106.1038	1.0786		
	4		98.8966	106.1036			
AVG.			98.8966	106.1038	1.0786		
Δ WT.			0.1598	5.4988	0.2329		

Δ Vlc = 35.1 ml

Δ DgV = 21.09 ft^3

Δ Mn 5891.5 mgm

LOAD 80 klb/hr

O_2 5.9 %

REMARKS: ______

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 19 (~~Inlet~~, Outlet) (Mech. Dust Collector) LOCATION ABMA test site F

Date 1-16-79 Box No. ________ Eng. ________

Test Description ________

Dry Gas Meter Vol (ft^3)

Final ________

Initial ________

Δ DgV ________

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					11		
BEAKER NO.			8	31			
DATE WT.			1-17-79	1-16-79			
TARE WT.	1		99.3339	103.9753	.8248		
	2		99.3337	103.9753	.8250		
	3		99.3340	103.9757	8251		
	4						
AVG.			99.3339	103.9754	.8250		
POST TEST WTS.							
	1		99.6173	104.4801	1.2672		
	2		99.6153	104.4778	1.2672		
	3		99.6151	104.4774	1.2667		
	4		99.6155	104.4773			
AVG.			99.6153	104.4775	1.2670		
Δ WT.			0.2814	0.5021	0.4420		

Δ Vlc = 33.9 ml

Δ DgV = 33.54 ft^3

Δ Mn 1225.5 mgm

LOAD 80 klb/hr

O_2 7.2 %

REMARKS: ________

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 20 econ OT (~~Inlet, Outlet~~) LOCATION ABMA test site F

Date 1-17-79 Box No.______ Eng. Bob Tidona

Test Description__________

Dry Gas Meter Vol (ft^3)

Final______

Initial______

Δ DgV______

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H$_2$O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO. 4	BLANK NO.	
BOTTLE NO.							
BEAKER NO.			#30	#17			
DATE WT.			1-19-79	1-17-79	1-17-79		
TARE WT.	1		103.1115	102.3127	.8537		
	2		103.1098	102.3128	.8536		
	3		103.1095	102.3127	.8537		
	4		103.1094				
AVG.			103.1096	102.3127	0.8537		
POST TEST WTS.							
	1		103.1662	104.5997	0.9620		
	2		103.1662	104.5995	0.9622		
	3		103.1662	104.5993	0.9622		
	4						
AVG.			103.1662	104.5995	0.9621		
Δ WT.			0.0566	2.2868	0.1084		

some spillage occurred during boil-off

Δ Vlc = 26.2 ml

Δ DgV = 21.21 ft^3

Δ Mn 2451.8 mgm

LOAD 60 klb/hr

O_2 8.4 %

REMARKS:______

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 21 (~~Inlet~~ Econ, Outlet) LOCATION ABMA F

Date 1-24-79 Box No.________ Eng. Tidona

Test Description 75% LOAD, NORM O_2, NORM OFA

Dry Gas Meter Vol (ft^3)

Final________

Initial________

Δ DgV________

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					6		
BEAKER NO.			#53	16			
DATE WT.			1-22-79	1-22-79	1-19-79		
TARE WT.	1		102.3094	98.7358	0.8198		
	2		102.3097	98.7356	0.8198		
	3		102.3096	98.7358	0.8198		
	4				—		
AVG.			102.3095	98.7357	0.8198		
POST TEST WTS.							
	1		102.4032	102.2218	1.0728		
	2		102.4028	102.2217	1.0734		
	3		102.4020	102.2219	1.0737		
	4				—		
AVG.			102.4027	102.2218	1.0733		
Δ WT.			0.0932	3.4861	0.2535		

Δ Vlc = 32.8 ml

Δ DgV = 24.68 ft^3

Δ Mn 3832.8 mgm

LOAD 60 klb/hr

O_2 8.0 %

REMARKS:________

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 21 (~~Inlet~~, Outlet) PC OUT LOCATION ABMA F

Date 1-24-79 Box No. ______ Eng. T. [illegible]

Test Description 75% LOAD, NORM O_2, NORM OFA

Dry Gas Meter Vol (ft^3)

Final ______

Initial ______

Δ DgV ______

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					7		
BEAKER NO.			#2	#31			
DATE WT.			1/22/79	1/22/79	1-19-79		
TARE WT.	1		100 6052	103.9747	0.8503		
	2		100 6057	103.9747	0.8506		
	3		100.6057	103.9747	0.8506		
	4						
AVG.			100.6055	103.9747	0.8505		

POST TEST WTS.

	1		101.0500	104.4972	1.1049		
	2		101.0500	104.4974	1.1056		
	3		101.0499	104.4967	1.1054		
	4				—		
AVG.			101.0500	104.4971	1.1053		
Δ WT.			0.4445	0.5224	0.2548		

Δ Vlc = 43.5 ml

Δ DgV = 37.28 ft^3

Δ Mn 1221.7 mgm

LOAD 60 klb/hr

O_2 8.9 %

REMARKS: ______

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 23 ([illegible] Econ Outlet) LOCATION ABMA F

Date 2/1/79 Box No. ______ Eng. ______

Test Description OPT O_2, OPT. OFA, NO ECON. REINJ.

Dry Gas Meter Vol (ft^3)

Final ______

Initial ______

Δ DgV ______

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					833		
BEAKER NO.			10	5			
DATE WT.			1-24-79	1-24-79	1-22-79		
TARE WT.	1		100.9373	99.9281	0.8244		
	2		100.9369	99.9277	0.8244		
	3		100.9368	99.9276	0.8241		
	4						
AVG.			100.9370	99.9278	0.8243		
POST TEST WTS.							
	1		101.0236	104.3631	1.0204		
	2		101.0234	104.3629	1.0206		
	3		101.0233	104.3629	1.0204		
	4						
AVG.			101.0234	104.3630	1.0205		
Δ WT.			0.0864	4.4352	0.1962		

Δ Vlc = 32.1 ml

Δ DgV = 27.12 ft^3

Δ Mn 4717.8 mgm

LOAD 80 klb/hr

O_2 6.3 %

REMARKS: ______

PARTICULATE LAB WORKSHEET

TEST NO. 23 (Mech. d.c. ~~Inlet~~, Outlet) LOCATION ABMA F

Date 2-1-79 Box No.______ Eng.______

Test Description OPT O_2, OPT OFA, NO ECON. REINJ.

Dry Gas Meter Vol (ft^3)

Final______

Initial______

Δ DgV______

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					829		
BEAKER NO.			8	1			
DATE WT.			1-24-79	1-24-79	1-22-79		
TARE WT.	1		99.3356	100.0780	0.8451		
	2		99.3360	100.0782	0.8449		
	3		99.3361	100.0785	0.8447		
	4						
AVG.			99.3359	100.0782	0.8449		
POST TEST WTS.							
	1		99.5802	100.6948	1.2591		
	2		99.5797	100.6946	1.2590		
	3		99.5798	100.6945	1.2590		
	4						
AVG.			99.5799	100.6946	1.2590		
Δ WT.			0.2440	0.6164	0.4141		

Δ Vlc = 46.9 ml

Δ DgV = 42.815 ft^3

Δ Mn 1274.5 mgm

LOAD 80 klb/hr

O_2 7.8 %

REMARKS:______

PARTICULATE LAB WORKSHEET

TEST NO. 24 (~~Inlet~~ Econ., Outlet) LOCATION ABMA F

Date 2-6-79 Box No.____ Eng.____

Test Description OPT. O_2, OPT. OFA - BRINK & PARTICULATES - 100% LOAD

Dry Gas Meter Vol (ft^3)

Final____

Initial____

Δ DgV____

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					6		
BEAKER NO.			4	11			
DATE WT.			2-5-79	2-5-79	2-5-79		
TARE WT.	1		100.7872	99.8083	1.5291		
	2		100.7867	99.8085	1.5293		
	3		100.7869	99.8084	1.5293		
	4						
AVG.			100.7869	99.8084	1.5292		
POST TEST WTS.							
	1		100.9132	105.5624	1.7804		
	2		100.9134	105.5630	1.7807		
	3		100.9134	105.5622	1.7808		
	4			105.5631			
AVG.			100.9133	105.5628	1.7806		
Δ WT.			0.1264	5.7544	0.2514		

Δ Vlc = 35.4 ml

Δ DgV = 24.12 ft^3

Δ Mn 6132.2 mgm

LOAD 80 klb/hr

O_2____ %

REMARKS:____

8830-5 rev.

PARTICULATE LAB WORKSHEET

Mech D.C.
TEST NO. 24 (~~Inlet~~, Outlet) LOCATION ABMA F

Date 2-6-79 Box No. Eng.

Test Description OPT. O_2, OPT. OFA - BRINK & PARTICULATES - 100% LOAD

Dry Gas Meter Vol (ft^3)
Final
Initial
Δ DgV

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					7		
BEAKER NO.			# 19	# X			
DATE WT.			2-5-79	2-5-79	2-5-79		
TARE WT.	1		98.5873	99.4354	0.7630		
	2		98.5874	99.4355	0.7632		
	3		98.5875	99.4354	0.7632		
	4						
AVG.			98.5874	99.4354	0.7631		
POST TEST WTS.							
	1		99.1617	99.7848	1.0919		
	2		99.1622	99.7846	1.0921		
	3		99.1624	99.7843	1.0920		
	4						
AVG.			99.1621	99.7846	1.0920		
Δ WT.			0.5747	0.3492	0.3289		

Δ Vlc = 43.4 ml LOAD 80 klb/hr

Δ DgV = 37.84 ft^3 O_2 %

Δ Mn 1252.8 mgm REMARKS:

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 29 (Econ [redacted], Outlet) LOCATION ABMA F

Date 2-12-79 Box No. ______ Eng. T. dora

Test Description ______

Dry Gas Meter Vol (ft^3)

Final ______

Initial ______

Δ DgV ______

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					833		
BEAKER NO.			#5	18			
DATE WT.			2/11/79	2/11/79	2/11/79		
TARE WT.	1		99.9275	101.6424	.7651		
	2		99.9276	101.6428	.7651		
	3		99.9272	101.6428	.7651		
	4						
AVG.			99.9274	101.6428	0.7651		
POST TEST WTS.							
	1		99.9999	106.5298	1.0101		
	2		99.9999	106.5300	1.0101		
	3		99.9998	106.5300	1.0103		
	4						
AVG.			99.9999	106.5399	1.0102		
Δ WT.			0.0725	4.8971	0.2451		

Δ Vlc = 70 ml LOAD 80. klb/hr

Δ DgV = 24.82 ft^3 O_2 5.0 %

Δ Mn 5214.7 mgm REMARKS: ______

PARTICULATE LAB WORKSHEET

TEST NO. 29 ([redacted], Outlet) Mech. DC. **LOCATION** ABMA F

Date 2-12-79 **Box No.** ______ **Eng.** Tidona

Test Description ______

Dry Gas Meter Vol (ft³)

Final ______

Initial ______

Δ DgV ______

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H₂O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.					829		
BEAKER NO.			#8	15			
DATE WT.			2/11/79	2/11/79	2/11/79		
TARE WT.	1		98.9311	101 4159	.7634		
	2		98.9311	101 4160	.7631		
	3		98.9308	101.4160	.7632		
	4						
AVG.			98.9310	101.4160	0.7632		
POST TEST WTS.							
	1		99 5800	102.0378	1.2156		
	2		99 5800	102.0384	1.2158		
	3		99.5797	102.0381	1.2158		
	4						
AVG.			99.5799	102.0381	1.2157		
Δ WT.			0.6489	0.6221	0.4525		

Δ Vlc = 46 ml

Δ DgV = 38.02 ft³

Δ Mn 1723.5 mgm

LOAD 80 klb/hr

O_2 6.3 %

REMARKS: ______

PARTICULATE LAB WORKSHEET

TEST NO. 35 (~~Inlet~~ Econ, Outlet) LOCATION ABMA Site F
Date 2/15/79 Box No. Eng.
Test Description

Dry Gas Meter Vol (ft^3)
Final
Initial
Δ DgV

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.			12	81	6		
BEAKER NO.							
DATE WT.			2/11/79	2/11/79	2/11/79		
TARE WT.	1		100.9694	98.9311	.7617		
	2		100.9692	98.9311	.7617		
	3		100.9692	98.9309	.7617		
	4						
AVG.			100.9693	98.9310	0.7617		

POST TEST WTS.

	1		101.0466	102.0167	.9225		
	2		101.0463	102.0167	.9225		
	3		101.0463	102.0166	.9224		
	4						
AVG.			101.0464	102.0167	0.9225		
Δ WT.			0.0771	3.0857	0.1608		

Δ Vlc = 29.1 ml
Δ DgV = 26.63 ft^3
Δ Mn 3323.6 mgm

LOAD 60 klb/hr
O_2 8.7 %
REMARKS:

8830-5 rev.

PARTICULATE LAB WORKSHEET

TEST NO. 35 DC. ~~(Inlet~~, Outlet) LOCATION ABMA SITE F

Date 2/15/79 Box No. ______ Eng. ______

Test Description ______

Dry Gas Meter Vol (ft^3)

Final ______

Initial ______

Δ DgV ______

Impinger Water Vol (ml)

	1	2	3	Total
Final				
Initial				
Δ Vlc				

CONTENT		H_2O RINSE	ACETONE RINSE	DRY FLASK	FILTER NO.	BLANK NO.	
BOTTLE NO.			31	10	7		
BEAKER NO.							
DATE WT.			2/11/79	2/11/79	2/11/79		
TARE WT.	1		103.9759	100.9356	.7653		
	2		103.9760	100.9355	.7651		
	3		103.9761	100.9356	.7651		
	4						
AVG.			103.9760	100.9356	0.7652		
POST TEST WTS.							
	1		~~104.1370~~	101.5129	.9655		
	2		104.1362	101.5127	.9655		
	3		104.1362	101.5126	.9658		
	4		104.1362				
AVG.			104.1362	101.5127	0.9656		
Δ WT.			0.1602	0.5771	0.2004		

Δ Vlc = 46 ml

Δ DgV = 38.650 ft^3

Δ Mn 937.7 mgm

LOAD 60 klb/hr

O_2 10.0 %

REMARKS: ______

SECTION 3.0
GASEOUS DATA

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3.1 GASEOUS EMISSION SUMMARY 117
3.2 GASEOUS EMISSION DATA SHEETS 120
3.3 SOx DATA SHEETS 141

GASEOUS EMISSION SUMMARY

Location: TEST SITE F

Fuel: PENN. A

				BOILER OUTLET												
TEST NO.	DATE	LOAD %	CONDITIONS	O_2 % Dry	CO_2 % Dry	CO ppm Dry	NO ppm Dry	NO_2 ppm Wet	HC ppm Wet	O_2 % Dry	CO_2 % Dry	CO ppm Dry	NO ppm Dry	SO_2 ppm Dry	SO_3 ppm Dry	NOTES
01	12-18-78	75.0	Mid load, vary O_2	8.9	10.0	146	343	1	0					944		
02	12-18-78	75.0	↓	9.5	9.6	173	345	5	19					826		
03	12-18-78	75.0		10.7	8.2	233	426	7	18					738		
04	12-18-78	75.0		7.8	11.6	137	322	3	28					937		
05	12-19-78	53.8	low load, baseline	9.4	10.0	175	297	3	0					908		PARTICULATE
06	12-20-78	52.9	low load, vary O_2	8.8	10.6	112	294	3	0					1062		
07	12-20-78	52.9	↓	11.3	9.0	252	389	11	0					1151		
08	12-20-78	529		7.2	125	77	237	6	0					1111		
09	12-20-78	52.9		12.7	7.3	420	442	8	0					1130		
10	1-4-79	976	Max load, baseline	8.2	11.1	252	348	0	0					1044		
11	1-5-79	99.1	Max load, vary O_2	8.1	108	231	413	7	0					1164		
12	1-5-79	99.1	↓	8.5	11.0	222	397	3	0					1109		
13	1-5-79	99.1		5.4	128	612	269	2	12					1108		
14	1-5-79	99.1		6.4	12.8	251	309	0	12					1164		
15	1-8-79	98.8	Max load, high O_2	7.8	11.1	250	384	1	1					966		PARTICULATE

NOTE: All parts per million (ppm) figures are corrected to a 3% O_2 constant dilution factor

GASEOUS EMISSION SUMMARY

Location: TEST SITE F

Fuel: PENN A & B

				Boiler Outlet												
TEST NO.	DATE	LOAD %	CONDITIONS	O_2 % Dry	CO_2 % Dry	CO ppm Dry	NO ppm Dry	NO_2 ppm Wet	HC ppm Wet	O_2 % Dry	CO_2 % Dry	CO ppm Dry	NO ppm Dry	SO_2 ppm Dry	SO_3 ppm Dry	NOTES
16A	1-9-79	99.6	OFA Flow rate	7.6	12.0	228	-	-	13					933		PENN A
16B	1-9-79	99.6	↓	7.2	12.8	163	-	-	13					991		↓
16C	1-9-79	99.6	↓	8.3	11.8	378	-	-	0					991		↓
17	1-10-79	99.1	Max load, low O_2	6.7	12.5	382	-	-	9					953		↓ PARTICULATES
18	1-15-79	99.1	Max load, Opt O_2, high OFA	5.5	13.4	429	263	5	5					1110		↓ ↓
19	1-16-79	99.1	Max load, Opt O_2, low OFA	5.9	12.6	607	309	5	16					1186		↓ ↓
20	1-17-79	74.8	Med load, norm O_2 & OFA	8.4	10.7	100	342	3	15					1088		↓ ↓
21	1-24-79	76.4	Med load, norm O_2 & OFA	8.0	11.0	107	314	2	27					1252		↓ ↓
22	1-31-79	99.4	Max load, opt O_2 and OFA	6.0	13.2	352	281	1	16					1126	0	↓ SASS & SO_x
23	2-1-79	100.0	NO REINJECTION Max load, opt O_2 & OFA	6.3	13.2	221	298	2	12					1058		↓ Brink & PARTICULATES
24	2-6-79	102.5	REINJECTION Max load, opt O_2, OFA	5.0	14.5	549	289	0	-					1131		↓ ↓
23A	2-8-79	99.4	NO REINJECTION Max load, opt O_2 & OFA	5.9	12.5	186	282	3	-					1387		↓ Brink
25	2-12-79	99.4	Max Load, vary O_2	8.3	10.3	172	395	26	-					708		PENN B
26	2-12-79	99.4	↓	7.0	11.6	253	323	3	-					687		↓
27	2-12-79	99.4	↓	6.4	11.8	198	297	2	-					708		↓
28	2-12-79	99.4	↓	4.6	12.8	437	264	8	-					688		↓

NOTE: All parts per million (ppm) figures are corrected to a 3% O_2 constant dilution factor

#15900

REV

GASEOUS EMISSION SUMMARY

Location: TEST SITE F

Fuel: PENN B

				BOILER OUTLET												
TEST NO.	DATE	LOAD %	CONDITIONS	O_2 % Dry	CO_2 % Dry	CO ppm Dry	NO ppm Dry	NO_2 ppm Wet	HC ppm Wet	O_2 % Dry	CO_2 % Dry	CO ppm Dry	NO ppm Dry	SO_2 ppm Dry	SO_3 ppm Dry	NOTES
29	2-12-79	100.5	Max load, opt O_2 + OFA	5.0	13.3	361	266	1	–					693		Brink + PARTICULATES
30	2-13-79	97.1	Max load, low O_2, high OFA	6.8	11.7	284	299	0	5					695	22	SASS + SOx
31	2-14-79	75.0	Med load vary O_2	9.9	9.2	139	328	5	14					610		
32	2-14-79	75.0	↓	11.5	8.4	207	452	4	8					763		
33	2-14-79	75.0	↓	8.2	11.4	78	290	0	14					637		
34	2-14-79	75.0	↓	6.2	12.4	96	228	1	10					639		
35	2-14-79	75.8	Med load, baseline	8.7	10.7	107	380	–	–					–		PARTICULATES

NOTE: All parts per million (ppm) figures are corrected to a 3% O_2 constant dilution factor

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
TEST NOS. 1-4
DATE DEC 18 1978

FUEL Pennsylvania (coal)
LOAD ~63 Klb/h
CONDITIONS BASELINE
DATA TAKEN BY Tidona / Buening

O2 variations

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2(wet) ~~Remarks~~
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc/cor
H	1000	8.45	11.1	93	133	·		216	310	214	307	2	3	0	0	680/976
1 (Econ Out)	1050	9.0	10.0	100	150	225	338									O2
2 (Econ Out)	1055	8.9	10.0	90	139	233	347									NORMAL
4 (D.C. Out)	1100	10.3	9.2	80	135	206	347									Test 1
5 (D.C. Out)	1103	9.8	9.0	90	145	210	337									
H (Econ Out)	1110	8.8	10.0	110	162			214	316	213	315	1	1	0	0	640/944
H (Econ Out)	1250	9.4	9.4	115	178			238	369	235	365	3	5	9	14	532/826
Ports 1 + 2 (Econ Out)	1300	9.65	9.8	110	174	248	393									Test 2
Ports 4+5 (D.C. Out)	1306	10.5	9.0	98	168	231	396									HIGH O2
H (Econ out)	1525	10.75	8.0	145	255	? 223	? 392	232	407	228	400	4	7	10	18	420/738
Port 1 & 2	1413	10.6	8.3	140	241	244	420									High O2
Port 4 & 5	1515	11.3	7.8	110	204	233	432									Test 3
H (Econ out	17:21	8.3	10.8	80	114	? 220	? 312	220	312	218	310	2	3	20	28	660/937
Port 1 & 2	1700	7.2	12.4	90	117	236	308									low O2
Port 4 & 5	1713	11.0	8.3	100	180	186	335									Test 4
						Dry NO RDGS from Port H (Hot Line) seem low										
		Averages do not include Ports 4+5														
Test 1	AVG.	8.9	10.0	▨	146	▨	343[1]	▨	316	▨	315	▨	1	▨	0	SO_2 (cor.) 944
Test 2	AVG.	9.5	9.6	▨	173	▨	395[1]	▨	369	▨	365	▨	5	▨	14	826
Test 3	AVG.	10.7	8.2	▨	233	▨	426[1]	▨	407	▨	400	▨	7	▨	18	738
Test 4	AVG.	7.8	11.6	▨	137	▨	322[1]	▨	312	▨	310	▨	3	▨	28	937

[1] Averages do not include Port H NO(dry) numbers

NOTE: Parts per million (ppm) figures are corrected to 3% O_2
Hot line wet samples not corrected to dry basis

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
TEST NO. 5
DATE DEC 19 1978

FUEL Pa. Med.-Volatile Bit. Coal
LOAD ~46 K lb/h
CONDITIONS LO LOAD, BASELINE, PARTICULATES
DATA TAKEN BY Tidona

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET) NOx		NO		NO2		HC		SO_2 ~~Remarks~~
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc/cor
H	10:15	9.5	10.0	110	172	181^2	283^2	188	294	186	291	2	3	0	0	580/908
Ports 1&2	10:25	9.3	9.9	95	146	193	297									Test 5
Ports 4&5	10:33	11.4	8.1	110	206	158	296									
Unit changed load at 17:30; couldnot get second set of gaseous emissions data																
Test 5	AVG.	9.4	10.0		175		297		294		291		3		0	908
	AVG.															
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O_2
Hot line wet samples not corrected to dry basis

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
TEST NOS. 6-9
DATE DEC 1978
20

FUEL Pa. Bituminous Coal
LOAD ~ 43 Klb/hr
CONDITIONS LO LOAD, O_2 VARIATIONS
DATA TAKEN BY Tidona / Stx

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 ~~Remarks~~
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc/cor
H	1035	8.8	10.6	70	103	195	288	190	280	188	277	2	3	0	0	720 / 1062
Port 1:2	1045	9.0	10.2	70	105	200	300									Baseline Test # 6
Port 4:5	1050	10.6	8.8	65	113	170	294									
H	1125	8.8	11.0	80	118	188	? 277	184	271	182	269	2	2	0	0	780 / 1151
Port 1:2	1133	8.8	10.6	70	103	198	292									Baseline Test # 6
Port 4:5	1137	10.5	8.8	75	129	173	297									
" H	1315	11.0	8.6	145	261	203	365	204	367	198	356	6	11	0	0	640 / 1152
Port 1:2	1400	11.6	9.4	140	268	193	370									Med. high O2 Test # 7
Port 4:5	1330	12.25	7.8	110	226	181	372									
H	1512	6.9	12.8	60	77	185	236	174	222	169	216	5	6	0	0	870 / 1111
Port 1:2	1505	7.4	12.2	60	79	184	244									lo O2
Port 4:5	1510	9.05	10.9	50	75	153	230									Test # 8
H	1600	12.4	7.55	210	440	199	? 417	208	435	204	427	4	8	0	0	540 / 1130
Port 1:2	1608	13.0	7.1	180	405	198	446									hi-O2
Port 4:5	1611	13.6	6.6	170	414	180	438									Test # 9
		do not incl. Ports 4+5					Values marked ? not incl. in averages									
Test 6	AVG.	8.8	10.6	▨	112		294	▨	276	▨	273	▨	3	▨	0	1062
Test 7	AVG.	11.3	9.0	▨	252	▨	369	▨	367	▨	356	▨	11	▨	0	1151
Test 8	AVG.	7.2	12.5	▨	77	▨	237	▨	222	▨	216	▨	6	▨	0	1111
Test 9	AVG.	12.7	7.3	▨	420	▨	442	▨	435	▨	427	▨	8	▨	0	1130

NOTE: Parts per million (ppm) figures are corrected to 3% O_2
Hot line wet samples not corrected to dry basis.

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
TEST NO. 10
DATE JAN 4 1979

FUEL Pa. Bituminous Coal
LOAD 80000 lb/hr (100% CAP.)
CONDITIONS BASELINE
DATA TAKEN BY

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 ~~Remarks~~
								NOx		NO		NO2		HC		
				unc	cor	unc	?cor	unc	cor	unc	cor	unc	cor	unc	cor	unc/cor
H	11:13	8.2	10.8	195	274	235	330			230	323			0	0	740/1040
H	11:45	8.5	10.6	200	288	— ?	?			232	334			0	0	700/1008
Port 4+5	11:54	9.0	10.3	180	270	205	308	—	—	–		—	—	—	—	Test 10 Baseline
H	14:50	8.1	10.8	180	251	246	343	245	342	245	342	0	0	0	0	720/1004
Port 4+5	15:09	9.0	9.6	160	240	232	348									Test 10 Baseline
H	15:30	8.2	11.6	160	225	255	359	254	357	254	357	0	0	0	0	800/1124
Port 4+5	15:40	9.0	10.6	145	218	240	360									Test 10 Baseline
	Test stopped: couldn't hold load on boiler. Outside temp. too warm.															
																SO_2 cor ↓
Test 10	AVG.	8.2	11.1	▨	252	▨	348	▨	339	▨	339	▨	0	▨	0	1044
	AVG.			▨		▨		▨		▨		▨		▨		
	AVG.			▨		▨		▨		▨		▨		▨		

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F

TEST NOS 11 - 14

DATE JAN. 05, 1979

FUEL Pa. Bituminous Coal

LOAD 100%

CONDITIONS Vary O_2

DATA TAKEN BY Tidona / Stix

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	UNCORR /CORR
H	1055	8.1	10.8	160	223	250	349	265	370	260	363	5	7	0	0	834 / 1164
P 4&5	1108	8.9	10.1	145	239	250	413									Test # 11 O_2 Variations Baseline
H	12:05	8.5	11.0	160	230			272	392	270	384	2	3	0	0	770/ 1109
P- 4+5	12:20	9.2	9.5	140	214	260	397									Test 12 Hi O_2
H	1300	5.4	12.8	500	577	230	265	220	254	218	252	2	2	10	12	960/ 1108
P- 4+5	1320	6.5	11.6	520	646	220	273									Test 13 low O_2
H	1405	6.4	12.8	190	222	242	298	235	290	235	290	0	0	10	12	944 / 1164
Port 4&5	1418	7.5	11.4	210	280	240	320									test 14- Med O_2
Test 11	AVG.	8.1	10.8		231		413		370		363		7		0	1164
Test 12	AVG.	8.5	11.0		222		397		392		384		3		0	1109
Test 13	AVG.	5.4	12.8		612		269		254		252		2		12	1108
Test 14	AVG.	6.4	12.8		251		309		290		290		0		12	1164

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F

TEST NO. 15

DATE Jan. 08, 1979

FUEL Pa. Bituminous Coal

LOAD 100%

CONDITIONS HIGH O_2, NORM OFA

DATA TAKEN BY Tidona / Stix

Particulates

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	UNCORR / CORR
H	1330	8.1	10.6	190	265	275	384	265	370	265	370	0	0	10	14	720 / 1005
P 4 & 5	1345	8.95	9.9	145	217	268	400									Test #15
H	1500	7.4	11.3	220	291	275	364	265	351	262	347	3	4	10	13	720 / 953
P 4 & 5	1510	8.8	10.3	160	236	270	398									Test #15
H	1535	7.8	11.3	200	273	278	379	270	368	270	368	0	0	10	14	690 / 941
P 4 & 5	1545	8.55	10.6	150	217	262	379									Test #15
																SO_2 cor.
Test 15	AVG.	7.8	11.1		250		384		363		362		1		14	966
	AVG.															
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ARMA - F
TEST NO. 16 A - B - C
DATE JAN 09 1979

FUEL Pa. Bituminous Coal
LOAD 100%
CONDITIONS OFA Variations, vel. traverses
DATA TAKEN BY Tidona / Stix

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc / cor
H	1430	7.7	11.3	170	230	←				NA			→	10	14	680 / 920
																Test # 16 - A
H	1515	7.6	12.4	180	242	←				NA			→	10	13	680 / 913
																Test # 16 - A
H	1535	7.4	12.4	160	212	←				NA			→	10	13	730 / 966
																Test # 16 - A
H	1620	7.2	12.8	125	163	←				NA			→	10	13	760 / 991
																Test # 16 - B
				→		Jan.		10, 1979		←						
H	1000	7.95	11.9	285	393	←				NA			→	0	0	720 / 994
																Test # 16 - C
H	1030	8.6	11.6	250	363	←				N/A			→	0	0	680 / 987
																Test # 16 - C
																Note: Hot line temp. @ 100°F instead of 350°F; HC readings may be off because of that.
																SO_2 cor.
16A	AVG.	7.6	12.0	▨	228	▨		▨		▨		▨		▨	13	933
16B	AVG.	7.2	12.8	▨	163	▨		▨		▨		▨		▨	13	991
16C	AVG.	8.3	11.8	▨	378	▨		▨		▨		▨		▨	0	991

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
TEST NO. 17
DATE 1-10-79

FUEL Pa Bituminous Coal
LOAD 100%
CONDITIONS LOW O_2, NORM OFA
DATA TAKEN BY Shik

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	UNCOR / COR
H	1340	6.7	12.8	330	415	←				N/A	→			0	0	750/ 944
P 4 & 5	1345	7.95	11.7	310	428	N/A										
H	1525	6.6	12.8	335	419	←				N/A	→			10	13	760 / 950
P 4 & 5	1535	7.35	11.7	360	475	N/A										
H	1620	6.8	12.0	230	292	←				N/A	→			10	13	760 / 965
P4 & 5	1625	7.7	11.3	195	263	N/A										
																SO_2 cor
~~(Part H)~~ Test 17	AVG.	6.7	12.5	▨	382	▨		▨		▨		▨		▨	9	953
	AVG.			▨		▨		▨		▨		▨		▨		
	AVG.			▨		▨		▨		▨		▨		▨		

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA site F

TEST NO. 18

DATE 1-15-79

FUEL Pa. Bituminous Coal

LOAD 100% (80 klb/hr)

CONDITIONS OPT. O_2, HIGH OFA, PARTICULATES

DATA TAKEN BY Tidona / Stix

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	UNCOR / CORR.
H	1335	6.3	12.8	160	196	223	273	208	255	206	252	2	3	10	12	824 / 1009
P 4 & 5	1405	7.0	12.0	105	135	193	248									
H	1410	5.4	13.4	220	254	213	246	198	228	195	225	3	3	0	0	930 / 1073
																Test # 18
H	1515	4.8	14.2	880	978	228	253	203	226	200	222	3	3	0	0	1020/1133
P 4 & 5	1520	6.3	12.8	620	759	210	257									
H	1645	5.4	13.2	220	254	260	300	238	275	230	265	8	10	10	12	1060/1223
																SO_2 cor
Test 18	AVG.	5.5	13.4		429		263		246		241		5		6	1110
	AVG.															
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F

TEST NO. 19

DATE 1-16-79

FUEL Pa. Bituminous Coal

LOAD 100%

CONDITIONS OPTIMUM O_2, LOW OFA, PARTICULATES

DATA TAKEN BY Tidona / Stix

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	UNCORR / CORR
H	2120	5.95	12.8	790	945	252	301	241	288	233	279	8	10	15	18	980 / 1172
P 4 & 5	2135	7.1	11.6	540	699	235	304									Test #19
H	2240	5.5	12.8	470	546	256	297	235	273	233	271	2	2	15	17	1020 / 1185
P 4 & 5	2255	7.6	11.3	275	369	245	329									Test #19 Compl. Part. at Pt. 6
H	2310	6.3	12.3	340	416	260	318	240	294	238	291	2	3	10	12	980 / 1200
P 4 & 5	2320	7.0	11.4	520	669	235	302									Test #19
																SO_2 cor
Test 19	AVG.	5.9	12.6		607		309		285		280		5		16	1186
	AVG.															
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA
TEST NO. 20
DATE 01-17-79

FUEL Pa. Bituminous Coal
LOAD 75 %
CONDITIONS Normal O^2, normal OFA Particulates
DATA TAKEN BY Stix

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	UNCORR/CORR
H	1615	7.5?	11.6?	70	93	236	315	220	293	218	291	2	2	15	20	800 / 1067
P4 & 5	1625	9.85	9.2	65	105	223	360									Test # 20
H	1630	8.3	10.3	65	92	244	346	228	323	228	323	0	0	10	15	790 / 1120
H	1745	8.6	10.8	80	116	236	343	223	324	220	319	3	4	10	15	740/1074
P4 & 5	1755	9.45	9.9	60	94	213	332									Test #
H	1815	8.2	10.9	70	98	238	335	223	314	220	309	3	4	10	14	760 / 1069
P 4 & 5	1820	9.45	9.9	60	94	215	335									Test #
																SO_2 cor
Test 20	AVG.	8.4	10.7		100		342		320		317		3		15	1088
	AVG.															
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA-F
TEST NO. 21
DATE JAN 24 1979

FUEL Pa Bituminous Coal
LOAD 75%
CONDITIONS NORM O_2, NORM OFA, PARTICULATES
DATA TAKEN BY Shx

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	UNCORR / CORR
H	1030	7.5	11.4	85	113	228	304	217	289	215	287	2	2	15	20	880 / 1173
P 1	1105	8.4	10.6	80	114	211	301									
P 4 & 5	1055	8.85	10.2	75	111	198	293									Test # 21
H	1210	8.1	11.4	85	119	240	335	225	314	223	311	2	3	25	35	900 / 1256
P 2	1225	8.2	11.0	80	112	230	323									
P 4 & 5	1220	8.95	10.3	75	112	213	318									Test # 21
H	1255	7.7	11.0	75	102	235	318	218	295	218	295	0	0	20	27	980 / 1326
P 2	1300	8.3	10.6	65	92	224	317									
P 4 & 5	1305	8.95	9.9	60	90	210	314									Test # 21
		PORTS (Ports	H & 1 4 & 5)													SO_2 cor
Test 21	AVG.	8.0	11.0		107		314		299		298		2		27	1252
	AVG.	(8.9)	(10.1)													
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
TEST NO. 22 / SASS & SO_3
DATE JAN 31 1979

FUEL PA. BITUMINOUS COAL
LOAD 100 %
CONDITIONS Optimum OFA ; Optimum O_2
DATA TAKEN BY Stix

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	UNCORR/CORR
H	1100	6.0	12.9	140	168	236	283	218	262	218	262	0	0	10	12	980 / 1176
P 3 & 4	1120	7.8	11.6	130	177	218	297									
H	1245	5.95	13.8	120	144	243	291	225	269	225	269	0	0	10	12	960 / 1148
P 3 & 4	1305	7.0	12.2	120	154	218	280									
H	1445	5.7	13.1	350	412	223	262	210	247	208	245	2	2	10	12	1040 / 1224
P 3 & 4	1455	6.3	12.3	540	661	214	262									
H	1605	5.95	12.8	520	622	233	279	216	258	214	256	2	2	20	24	880/1052
P 3 & 4	1610	6.7	12.1	500	629	223	281									
H	1820	6.3	13.3	240	294	235	288	216	264	216	264	0	0	15	18	840/ 1029
P 3 & 4	1830	6.95	12.3	200	256	225	288									
		Port	H													
		(Ports	3 & 4)													$(SO_2)_{cor}$
Test 22	AVG.	6.0	13.2		352		281		260		259		1		16	1126
	AVG.	(7.0)	(12.1)													
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F

TEST NO. 23 BRINK & PARTICULATE

DATE FEB 1 1979

FUEL PA. Bituminous Coal

LOAD 100 %

CONDITIONS Optimum OFA, Optimum O_2, NO ECON HOPPER REINJECTION

DATA TAKEN BY Shi

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	UNCORR / CORR
H	1035	6.1	13.4	130	157	252	304	238	288	235	284	3	4	10	12	770 / 930
P 3 · 4	1055	7.6	11.3	120	161	225	302									HOTLINE: PORT #3 · BRINK
P 5 & 6	1055	7.7	11.7	110	149	228	309									
P 3-4-5-6	1050	8.05	11.3	90	125	220	306									
H	1210	5.95	14.0	120	144	258	309	232	277	230	275	2	2	10	12	790 / 945
P 3-4-5-6	1220	7.4	12.0	100	132	226	299									Hotline Port 3 Brink
H	1345	6.05	13.6	160	193	240	289	221	266	220	265	1	1	10	12	840 / 1011
P3-4-5-6	1350	7.6	12.0	140	188	214	287									HOTLINE PORT # 2 PARTICULATE
H	1545	6.1	13.1	280	338	231	279	211	255	209	252	2	3	10	12	960 / 1160
P 3 & 4	1535	7.8	11.6	380	518	204	278									HOTLINE PORT # 1 PARTICULATE
H	1625	7.4	12.0	220	291	229	303	211	279	209	277	2	2	10	12	940 / 1244
P3-4-5-6	1700	8.25	10.9	180	254	218	308									HOTLINE PORT # 1 PARTICULATE.
		Port (Ports 3,	H 4, 5, + 6)													$(SO_2)_{cor}$
Test 23	AVG.	6.3	13.2		221		298		273		271		2		12	1058
	AVG.	(7.8)	(11.5)													
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
TEST NO. 24 / Brink & Particulates
DATE 2-6-79

FUEL Pa. Bituminous Coal (Clearfield Co.)
LOAD 80,000 lb/h (100%)
CONDITIONS OPT. O_2, OPT. OFA
DATA TAKEN BY Stix

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 Remarks UNCORR / CORR
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H	1215	4.65	14.8	620	683	265	292	245	270	245	270	0	0	N/A		960 / 1057
Port 3 & 4	1230	6.3	12.8	340	416	240	294									H = Port # 2 - BRINK
Port 5 & 6	1235	6.4	12.8	360	444	243	300									
H	1310	4.6	14.9	440	483	268	294	245	269	245	269	0	0	N/A		1020 / 1120
Ports 3 & 4	1315	6.4	13.6	420	518	240	296									H = Port # 2
Ports 5 & 6	1315	6.25	13.6	440	537	242	295									= BRINK
Ports 3-4-5-6	1320	6.3	13.6	440	539	240	294									
H	1425	5.2	13.6	320	365	260	296	240	273	240	273	0	0	N/A		940 / 1071
Ports 3 & 4	1435	7.0	12.0	220	283	238	306									H = Port # H
Ports 5 & 6	1440	6.5	11.9	480	596	242	300									= Particulates
Ports 3-4-5-6	1440	6.5	11.9	800	993	240	298									
H	1555	5.6	14.4	620	725	235	275	220	257	220	257	0	0	N/A		990 / 1157
Ports 3 & 4	1615	8.1	12.5	170	237	222	310									H = Port # 2
		(?)	(?)													= Particulates
H	1700	4.7	14.7	400	442	238	263	220	243	220	243	0	0	N/A		1130 / 1248
P 3 & 4	1715	7.2	12.3	540	704	215	280									H = Port # 2
P 5 & 6	1710	6.05	12.8	460	554	225	271									Particulates
P 3-4-5-6	1705	6.5	12.8	400	497	215	267									
		Port	H													
		(Ports 3,	4, 5, 6)													SO_2 cor
Test 24	AVG.	5.0	14.5	▨	549	▨	289	▨	262	▨	262	▨	0	▨	—	1131
	AVG.	(6.5)	(12.7)	▨		▨		▨		▨		▨		▨		
	AVG.			▨		▨		▨		▨		▨		▨		

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
TEST NO. 23A / BRINK TEST
DATE 2-8-79

FUEL Pa. Bit. Coal
LOAD 100%
CONDITIONS OPTIMUM O_2 & OFA, NO ELON. HOPPER REINJ.
DATA TAKEN BY M.G. Gabriel

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								SO_2 Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	uncorrected/corrected
H	1210	6.14	12.4	120	145	224	271	202	245	200	242	2	3	N/A	N/A	1110 / 1345
Port 1	1223	5.15	13.0	220	250	240	273									H = Port 2
																SO_2
H	1240	6.00	12.4	160	192	235	282	217	260	215	258	2	2	N/A	N/A	1110 / 1332
Port 1	1255	5.5	12.4	140	163	245	285									
																SO_2
H	1323	6.7	12.4	185	233	228	287	214	269	210	264	4	5	N/A	N/A	1180 / 1485
Port 1	1335	5.85	12.6	112	133	245	291									
																SO_2 cor
Test 23A	AVG.	5.9	12.5	▨	186	▨	282	▨	258	▨	255	▨	3	▨	—	1387
	AVG.			▨		▨		▨		▨		▨		▨		
	AVG.			▨		▨		▨		▨		▨		▨		

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F
TEST NOS. 25 - 28
DATE FEB 12 1979

FUEL Pa. Bit Coal (Coal B)
LOAD 100%
CONDITIONS O_2 Variations, Norm OFA
DATA TAKEN BY M. G. Gabriel

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET) NOx		NO		NO2		HC		SO_2 Remarks
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	Uncor. / Correc.
H	1008	8.61	10.2	120	174	275	399	281	408	263	382	18	26	I.O.	O.S.	498 / 708
1 & 2	1025	7.89	10.2	124	170	288	396									
3,4,5,6	1050	8.35	10.6	120	171	275	391									Test 25 / Hi O2
																SO_2
H	1107	6.95	12.8	180	231	285	365	260	333	258	331	2	2.56	—		536 / 687
1 & 2	1135	6.5	11.3	200	248	284	253									
3,4,5,6	1148	7.46	10.6	210	279	264	351									Test #26 base O2
																SO_2
H	1250	6.25	12.4	170	207	250	305	228	278	226	276	2	2.44	—		580 / 708
1 & 2	1307	5.96	12.1	140	168	245	293									
3,4,5,6	1310	7.0	11.0	170	219	228	293									Test 27 mod. low O2
																SO_2
H	1420	4.25	13.6	430	462	245	263	222	239	215	231	7	8	—		640 / 688
1 & 2	1430	4.24	13.3	525	564	245	263									
3,4,5,6	1436	5.25	11.4	250	286	234	267									Test 28 low O2
		ECON / STACK	H,1,2 / 3,4,5,6													
Test 25	AVG	8.3 / 8.4	10.2 / 10.6	[illegible]	172 / 171	[illegible]	398 / 391						26 /		OOS	708
26	AVG.	6.7 / 7.5	12.1 / 10.6		240 / 279		359 / 351						3 /			687
27	AVG.	6.1 / 7.0	12.3 / 11.0		188 / 219		299 / 293						2 /			708
28	AVG.	4.25 / 5.3	13.5 / 11.4		513 / 286		263 / 267						8 /		✓	688

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA F

TEST NO. 29 / Particulates & Brink

DATE 2-12-79

FUEL Pa. Bituminous Coal (Coal B)

LOAD 100%

CONDITIONS OPTIMUM O_2 & OFA (LOW O_2, HIGH OFA)

DATA TAKEN BY Tidona

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	SO_2 unc/cor
H	18:15	5.5	12.9	420	488	228	265	207	240	205	238	2	2	I.O.	O.S.	586/681
3,4,5,6	18:39	6.1	12.0	300	362	215	260									TEST #29
																(Particulates)
H	21:00	4.5	13.6	300	327	247	269	221	241	221	241	0	0	—		646/705
3,4,5,6	21:15	6.4	11.3	215	265	217	268									TEST #29
																(Brink)
		Port H (Ports 3,4,5,6)														(SO_2)cor
TEST #29	AVG.	5.0	13.3		361		266		241		240		1		—	693
	AVG.	(6.3)	(11.7)													
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA site F
TEST NO. 30/Goksoyr-Ross + SASS
DATE 2-13-79

FUEL Penn - Bit.
LOAD 100%
CONDITIONS low O_2 High O.F.A
DATA TAKEN BY M.G. Gabriel, J. Cook

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
																SO_2
H	1120	6.25	11.0	260	317	230	281	210	256	209	255	1	1.2	5	6.1	588/ 718
3,4,5,6	1155	7.2	10.6	205	267	220	287									Uncorrect - Correct
																Goksoyr-Ross H in port #2
H	3:37	5.8	12.8	250	296	240	284	221	262	219	259	2	2.4	3	3.6	580 /687
3,4,5,6	3:54	6.5	12.0	270	335	222	276									
H	4:40	5.8	13.2	300	355	245	290	222	263	225	266	-3	-3.6	8	9.5	600/710
3,4,5,6	4:50	6.5	12.4	320	397	223	277									
H	5:25	6.5	12.4	340	422	230	286	212	263	212	263	0	0	0	0	570/708
3,4,5,6	5:37	6.7	12.0	250	315	227	286									
H	6:15	6.7	12.8	160	201	238	300	221	278	221	278	0	0	5	6.3	544/685
3,4,5,6	6:30	7.6	11.3	160	215	260	349									Boiler not
																firing properly
H	7:05	5.7	12.4	115	135	270	318	241	284	240	282	1	2	5	5.9	560/659
3,4,5,6	7:25	6.4	11.7	140	173	260	321									
H	7:40	5.6	12.0	120	140	272	318	245	286	242	283	3	3.5	8	9.3	560/654
3,4,5,6	AVG.	6.82	11.7		284		299		268		267		0.3		5.2	/695
H	AVG.	6.05	13.8		267		298									
	AVG.															

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

Pbar 29.88

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA Site F
TEST NO. 31 – 34
DATE 2/14/79

FUEL Penn. Bit. Coal B
LOAD 60,000 lb/hr
CONDITIONS Vary O_2
DATA TAKEN BY JEC

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	SO_2 corr, unc
3,4,5,6	10:30	10.5	8.6	95	163	190	326									
H	10:40	11.0	8.0	80	144	175	315	171	308	168	302	3	5.4	8	14	300/540 (?)
1,2	11:00	9.1	10.2	97	147	210	318									Test #31
3,4,5,6	11:10	10.25	9.0	80	133	200	335									
H	11:20	9.9	9.2	80	130	205	332	194	314	192	311	2	3.2	8	13	420/681
1,2	11:35	8.9	9.8	65	97	222	330									Test #31
	Test	#	32		High	O_2										
H	12:05	11.75	7.7	120	233	212	412	212	412	210	409	2	4	4	8	392/763
	12:20	11.0	8.7	110	198	240	444									Test #32
3,4,5,6	12:30	11.8	8.2	108	211	233	456									
	Test	#	33		Low	O_2										
1,2	13:00	7.7	11.7	60	81	217	294									
H	13:15	8.0	11.3	70	97	206	285	190	263	190	263	0	0	10	14	460/637
3,4,5,6	13:35	8.5	11.3	56	72	200	288									Test #33
	Test	#34		low		O_2										
1,2	14:03	5.1	13.9	98	111	190	215									
H	14:20	5.8	13.2	97	115	190	225	170	201	169	200	1	1	8	9.5	540/639
3,4,5,6	14:30	6.8	11.7	70	89	185	235									Test #34
					NO		CO									
31	AVE	9.7	9.3		326		130		308				4.3		14	611
32	AVG.	11.4	8.2	▨	428	▨	216	▨		▨		▨	4.0	▨	8	763
33	AVG.	79	11.5	▨	290	▨	92	▨		▨		▨	0	▨	14	637
34	AVG.	5.5	13.6	▨	220	▨	113	▨		▨		▨	1	▨	9.5	639

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB

GASEOUS EMISSIONS DATA

TEST SITE ABMA SITE F

TEST NO. 35

DATE 2/14/79

FUEL Penn. Bit

LOAD 75%

CONDITIONS Norm O_2, Norm OFA

DATA TAKEN BY DBC

Probe Position	Time	O_2 % (dry)	CO_2 % (dry)	CO ppm(dry)		NO ppm(dry)		HOT LINE SAMPLES, PPM(WET)								Remarks
								NOx		NO		NO2		HC		
				unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	unc	cor	
H (Cold Line)	16:15	9.2	9.9	70	107	240	366									Cold line at
3, 4, 5, 6	16:30	10.0	9.5	70	114	240	393									Port H
#2 (cold line)	17:20	8.6	11.3	70	102	250	363									+line at port
3, 4	17:30	10.25	9.3	65	109	232	388									#2
#2 (cold line	18:00	8.4	10.9	70	100	260	371									+line at Port
3, 4, 5, 6	18:15	9.7	9.5	70	112	250	398									#2
		Econ	Out													
		(D.C.	Out)													
Test #35	AVG.	8.7	10.7	▨	107	▨	380	▨		▨		▨		▨		
	AVG.	(10.0)	(9.4)	▨		▨		▨		▨		▨		▨		
	AVG.			▨		▨		▨		▨		▨		▨		

NOTE: Parts per million (ppm) figures are corrected to 3% O_2

KVB®

SO$_x$ DATA SHEET (GOKSOYR-ROSS METHOD)

Test No. 22 Date Jan 31 1979 Location TEST SITE F

Unit No. ______ Fuel PENN A

Capacity 99.4% Unit Type 80,000 LB/HR Spreader stoker

Engr. Bob Tidona Conditions Max Load, opt O2 and OFA

Meter Finish 328.581

Meter Start 327.095

Sample Volume Collected = 1.486 ADCF $\times \frac{P_m}{P_{STD}} \times \frac{T_{STD}}{T_m} =$ 1.416 DSCF

Start Time	Stop Time	Elapsed Time (minutes)
14:31	14:51	20

Total Sampling Time = 20 min.

Time	Meter Vac. ("Hg)	Temperatures (°F)					Sample Flow Rate (ADCFM)
		Meter	Coil In	Coil Out	Water Bath	Stack	
14:31	10.4	98	120	103	143	430	0.074
14:36	10.4	98	121	104	143	430	0.074
14:41	10.4	98	121	105	143	429	0.074
14:47	10.4	98	121	106	143	429	0.074
14:51	10.4	99	120	106	143	429	0.074

NOTES: (1) Sample flow rate at meter should be 0.075 ADCFM or 0.01 cf/8 secs.

(2) Total sample volume collected should be ~1.5 cf (~ 20 minutes sampling time).

Date 1/31/79

K V B. INC.

Test No. 22

SOx DATA SHEET

TEST NO. 22 UNIT NO. ____ FUEL COAL LOAD ______ klb/hr ___ Location ABMA-F

Box No.					
Time					
Temp. in Gas Meter					
Press. in Gas Meter					
Meter Reading					
Barom. Press.					
Percent Oxygen					
N_2 Purge Time					

Calculation: SO_3 or SO_2, ppm = $\frac{(A - B) \times N \times F \times (460 + T) \times 24}{V (P + p)}$

Excess O_2 6.0 %

	SO_2	SO_3	SO_x
A = Ml of NaOH soln ~~lead perchlorate~~ used for sample =	no SO_2	0	
B = Ml of NaOH soln ~~lead perchlorate~~ used for blank =	sample	0	
N = Normality of lead perchlorate titrant =	taken	0.0236	
F = Dilution factor =		1.0	
T = Average temp. in gas meter =		98°F	
V = Volume of gas sample ft^3 =		1.416	
P = Barometric pressure =		30.02	
p = Pressure in gas meter, in. Hg =		19.62	
Concentration, C, ppm =		0	
, gm/dscm =		0	
Emission, E, g/Mcal =		0	
lb/MBtu =		0	
ng/J =		0	

$E = CF\left[\frac{2090}{20.9 - xO_2}\right]$

where

C = pollutant concentration, g/dscm

F, volume factor = __________ dscm/10^4 cal

__________ dscf/10^4 Btu

from Fed. Reg. 9/11/74 p 32856

60-14
rev. 1/2/75

KVB

SO$_x$ DATA SHEET (GOKSOYR-ROSS METHOD)

Test No. 30 Date Feb 13 1979 Location TEST SITE F

Unit No. ______ Fuel PENN A

Capacity 97.1 % Unit Type 80,000 LB/HR spreader stoker

Engr. Bob Tidona Conditions MAX LOAD, low O_2 high OFA

Meter Finish 345.965

Meter Start 344.380

Sample Volume Collected = 1.585 ADCF $\times \frac{P_M}{P_{STD}} \times \frac{T_{STD}}{T_M} = 1.544$ DSCF

Start Time	Stop Time	Elapsed Time (minutes)
11:22	11:43	21

Total Sampling Time = 21 min.

Time	Meter Vac. ("Hg)	Temperatures (°F)					Sample Flow Rate (ADCFM)
		Meter	Coil In	Coil Out	Water Bath	Stack	
11:22	5	86	94	119	144	337	0.0755
11:28	5	83	95	113	144	338	0.0755
11:34	4.5	83	96	113	144	335	0.0755
11:40	4.5	83	97	111	144	338	0.0755

NOTES: (1) Sample flow rate at meter should be 0.075 ADCFM or 0.01 cf/8 secs.

(2) Total sample volume collected should be ~1.5 cf (~ 20 minutes sampling time).

Date 2/13/79

K V B. INC.

Test No. 30

SOx DATA SHEET

TEST NO. 30 UNIT NO. _____ FUEL COAL LOAD ______ klb/hr ____ Location ABMA-F

Box No.					
Time					
Temp. in Gas Meter					
Press. in Gas Meter					
Meter Reading					
Barom. Press.					
Percent Oxygen					
N_2 Purge Time					

Calculation: SO_3 or SO_2, ppm = $\frac{(A - B) \times N \times F \times (460 + T) \times 24}{V (P + p)}$

Excess O_2 6.8 %

	SO_2	SO_3	SO_x
A = Ml of ~~lead perchlorate~~ NaOH soln. used for sample =	no SO_2	2.2	
B = Ml of ~~lead perchlorate~~ NaOH soln. used for blank =	sample	0.0	
N = Normality of lead perchlorate titrant =	taken	0.0236	
F = Dilution factor =		1.0	
T = Average temp. in gas meter, °F =		84	
V = Volume of gas sample ft^3 =		1.544	
P = Barometric pressure =			
p = Pressure in gas meter, in Hg =		25.17	
Concentration, C, ppm =		17.4 / corr to 3% O_2 22	
, gm/dscm =			
Emission, E, g/Mcal =			
lb/MBtu =			
ng/J =			

$E = CF\left[\frac{2090}{20.9 - xO_2}\right]$

where

C = pollutant concentration, g/dscm

F, volume factor = __________ dscm/10^4 cal

__________ dscf/10^4 Btu

from Fed. Reg. 9/11/74 p 32856

SECTION 4.0
PARTICULATE SIZE DISTRIBUTION

PAGE

4.1 BRINK 146
4.2 SASS 158
4.3 BAHCO 159

KVB

BRINK CASCADE IMPACTOR DATA REDUCTION

TEST NO. 23
TEST SITE ABMA Site F
TEST DATE 2/1/79
SAMPLE LOCATION Econ. Out
LOAD 80,000 lb/hr
% O_2 2.5
FUEL Pennsylvania Bit.
SPECIAL CONDITIONS Low O_2, High OFA

ρp - Density of particles 2.5 g/cm^3
μ - Viscosity of flue gas 2.45 × 10^{-4} poise
MWs - Molecular wt. flue gas 29.4 g/g mole
ΔP_I - Pressure drop across impactor 6.1 in H_2O
Ps - Absolute stack pressure 28.99 in. Hg
Ts - Absolute stack temperature 860 °R
Qs - Actual flow rate at stack conditions 0.0643 ft^3/min
Vm - Dry gas volume 2.016 SCF
Mn - Total particulate mass 180.8 mgm
Cn - Total concentration 1.385 grains/SCF
I - Percent isokinetics 142 %
Vs - Gas velocity 31.48 ft/sec.
Dn - Nozzle diameter 0.079 in.

Stage Number	CYCLONE	1	2	3	4	5	FINAL FILTER
Dj - Jet Diameter, cm		0.2490	0.1775	0.1396	0.0946	0.0731	
Fj - Press. factor, n.d.		0.0210	0.0273	0.0395	0.0903	0.3277	
$D_{S,50}$ Stokes diameter, μm		3.02	1.75	1.17	0.58	0.34	
$D_{A,50}$ Aerodynamic diameter, μm		4.88	2.87	1.95	1.02	0.64	
$D_{AI,50}$ Aerodynamic impaction diameter, μm		5.05	3.04	2.12	1.18	0.80	
Mn - Particulate mass, mgm	176.5	0.3	1.2	1.2	0.7	0.7	0.2
% - Percent of Total	97.6	0.2	0.7	0.7	0.4	0.4	0.1
Cumulative percent	2.5	2.3	1.6	0.9	0.5	0.1	
Cn - Concentration, grains/SCF	1.352	0.002	0.009	0.009	0.005	0.005	0.002
Cumulative concentration, grains/SCF	1.352	1.354	1.363	1.372	1.377	1.382	1.384

KVB

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 23

LOAD 80,000 lb/hr

TEST SITE ABMA Site F

% O_2 7.5

TEST DATE 2/1/79

FUEL Pennsylvania Bit.

SAMPLE LOCATION Econ. Out

SPECIAL CONDITIONS Low O_2, High OFA

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP 0.20

BAROMETRIC PRESS in. Hg, P_{bar} 29.21

GAS TEMP. °R, Ts 860

GAS STATIC PRESS in. H_2O -3.6

PITOT CORRECTION FACTOR, Cp 0.837

GAS STATIC PRESS in. Hg abs, Ps 28.99

MOLECULAR WT. FLUE GAS, MW_s 29.4

$$Vs = 85.48\ Cp \left(\frac{Ts\ \Delta P}{Ps\ MWs}\right)^{1/2} = 31.48 \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, Dn 0.079

NOZZLE AREA ft^2, An 3.404×10^{-5} $An = \pi(Dn/24)^2$

$Qn = Vs\ An\ 60$ = 0.0643 ft^3/min at nozzle

$Qc = Qs \left(\frac{PsMWs}{\underset{1.6}{\cancel{1.3}}Ts}\right)^{1/2}$ = 0.0517 ft^3/min corrected to calibration conditions

PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE 6.1 in. H_2O

OPERATING VACUUM (corrected for static pressure of duct) 9.6 in. H_2O

ISOKINETICS DETERMINATION

	SAMPLE TIME (θ)	METER READING (Vm)	METER TEMP (Tm)
INITIAL	10:42	328.838	86
FINAL	11:19	330.854	88
Δ	37	2.016	87

$\%H_2O$ = 5 %

$$I = \frac{1.667\ Ts\ Vm\ P_{bar}}{\theta\ Tm\ Vs\ Ps\ An(1-\frac{\%H_2O}{100})} = 142\ \%$$

KVB

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 23

LOCATION ABMA F

TEST DATE

ENGINEER T. DANA

TEST DESCRIPTION OPTIMUM O_2, OPTIMUM OFA, NO ECON. REINJECTION

PRE TEST WEIGHTS (GRAMS)

PLATE NO.		CYCLONE	1	2	3	4	5	FINAL FILTER
DATE WT.		1-23-79	1-23-79	1-23-79	1-23-79	1-23-79	1-23-79	1-23-79
TARE WT.	1	0.4171	3.6636	3.3543	3.7363	3.2855	3.7592	0.0393
	2	0.4190	3.6634	3.3538	3.7364	3.2850	3.7589	0.0390
	3	0.4186	3.6635	3.3538	3.7365	3.2850	3.7589	0.0391
	4	0.4189						
AVERAGE		0.4188	3.6635	3.3540	3.7364	3.2852	3.7590	0.0391

POST TEST WEIGHTS (GRAMS)

DATE WT.								
GROSS WT.	1	0.5951	3.6638	3.3550	3.7375	3.2859	3.7596	0.0394
	2	0.5952	3.6637	3.3553	3.7377	3.2859	3.7597	0.0394
	3	0.5953	3.6639	3.3554	3.7377	3.2860	3.7597	0.0392
	4							
AVERAGE		0.5953	3.6638	3.3552	3.7376	3.2859	3.7597	0.0393

NET TEST RESULTS (MILLIGRAMS)

NET WT.	0.1765	0.0003	0.0012	0.0012	0.0007	0.0007	0.0002
PERCENT	97.62	0.17	0.66	0.66	0.39	0.39	0.11

TOTAL NET WEIGHT 0.1808 mgm

KVB

BRINK CASCADE IMPACTOR DATA REDUCTION

TEST NO. 23 A
TEST SITE F
TEST DATE 2/8/79
SAMPLE LOCATION Econ. Out

LOAD 100 %
% O_2 5.9
FUEL Pennsylvania Bituminous
SPECIAL CONDITIONS Optimum

ρp - Density of particles 2.5 g/cm^3
μ - Viscosity of flue gas 2.4×10^{-4} poise
MWs - Molecular wt. flue gas 29.4 g/g mole
ΔP_I - Pressure drop across impactor 5.7 in H_2O
Ps - Absolute stack pressure 29.35 in. Hg
Ts - Absolute stack temperature 830 °R
Qs - Actual flow rate at stack conditions 0.0608 ft^3/min

Vm - Dry gas volume 3.06 SCF
Mn - Total particulate mass 233.9 mgm
Cn - Total concentration 1.180 $\frac{grains}{SCF}$
I - Percent isokinetics 133 %
Vs - Gas velocity 29.77 ft/sec.
Dn - Nozzle diameter 0.079 in.

Stage Number	CYCLONE	1	2	3	4	5	FINAL FILTER
Dj - Jet Diameter, cm		0.2490	0.1775	0.1396	0.0946	0.0731	
Fj - Press. factor, n.d.		0.0210	0.0273	0.0395	0.0903	0.3277	
$Ds_{\overline{50}}$ Stokes diameter, μm		3.09	1.80	1.21	0.61	0.36	
$D_{A,\overline{50}}$ Aerodynamic diameter, μm		4.98	2.93	2.00	1.05	0.66	
$D_{AI,\overline{50}}$ Aerodynamic impaction diameter, μm		5.14	3.10	2.16	1.20	0.82	
Mn - Particulate mass, mgm	197.2	7.6	9.3	8.9	7.5	3.4	0.0
% - Percent of Total	84.3	3.2	4.0	3.8	3.2	1.5	0.0
Cumulative percent	15.7	12.5	8.5	4.7	1.5	0.0	
Cn - Concentration, grains/SCF	0.995	0.038	0.047	0.045	0.038	0.017	0.000
Cumulative concentration, grains/SCF	0.995	1.033	1.080	1.125	1.163	1.180	1.180

KVB

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 23 A

LOAD 100 %

TEST SITE F

% O_2 5.9

TEST DATE 2/8/79

FUEL Pennsylvania Bituminous

SAMPLE LOCATION

SPECIAL CONDITIONS Optimum

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP 0.18

GAS TEMP. °R, Ts 830

PITOT CORRECTION FACTOR, Cp 0.837

BAROMETRIC PRESS in. Hg, P_{bar} 29.57

GAS STATIC PRESS in. H_2O -3.0

GAS STATIC PRESS in. Hg abs, Ps 29.35

MOLECULAR WT. FLUE GAS, MW_s 29.4

$$V_s = 85.48\ C_p \left(\frac{T_s\ \Delta P}{P_s\ MW_s}\right)^{1/2} = 29.77 \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, Dn 0.079

NOZZLE AREA ft^2, An 3.404×10^{-5} $A_n = \pi(D_n/24)^2$

$$Q_n = V_s\ A_n\ 60 = 6.08 \times 10^{-2} \text{ ft}^3\text{/min at nozzle}$$

$$Q_c = Q_s \left(\frac{P_s MW_s}{\underset{1.6}{\cancel{1.3}}\,T_s}\right)^{1/2} = 0.049 \text{ ft}^3\text{/min corrected to calibration conditions}$$

PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE 5.7 in. H_2O

OPERATING VACUUM (corrected for static pressure of duct) 8.5 in. H_2O

ISOKINETICS DETERMINATION

	SAMPLE TIME (θ)	METER READING (Vm)	METER TEMP (Tm)
INITIAL	12:10	337.830	83
FINAL	13:11	340.890	88
Δ	61	3.06	86

$\%H_2O$ = 5 %

$$I = \frac{1.667\ T_s\ V_m\ P_{bar}}{\theta\ T_m\ V_s\ P_s\ A_n\left(1 - \frac{\%H_2O}{100}\right)} = 133\ \%$$

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KVB

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 23A LOCATION ABMA F / Econ. OUTLET

TEST DATE 2-8-79 ENGINEER TIDONA

TEST DESCRIPTION REPEAT BRINK TEST FOR TEST #23

PRE TEST WEIGHTS (GRAMS)

PLATE NO.		Cooker CYCLONE #13	1	2	3	4	5	FINAL FILTER
DATE WT.		2/8/79	2/8/79	2/8/79	2/8/79	2/8/79	2/8/79	2-7-79
TARE WT.	1	103.3635	3.6579	3.3479	3.7320	3.2793	3.7530	0.0391
	2	103.3635	3.6573	3.3476	3.7321	3.2791	3.7527	0.0391
	3	103.3637	3.6573	3.3476	3.7320	3.2791	3.7529	0.0388
	4							
AVERAGE		103.3635	3.6575	3.3477	3.7320	3.2792	3.7528	0.0390

POST TEST WEIGHTS (GRAMS)

DATE WT.		2/9/79	2/9/79	2/9/79	2/9/79	2/9/79	2/9/79	2/9/79
GROSS WT.	1	103.5605	3.6651	3.3570	3.7407	3.2867	3.7564	.0389
	2	103.5607	3.6651	3.3570	3.7409	3.2867	3.7562	.0391
	3	103.5608	3.6653	3.3569	3.7409	3.2866	3.7560	.0391
	4							
AVERAGE		103.5607	3.6651	3.3570	3.7409	3.2867	3.7562	.0390

NET TEST RESULTS (MILLIGRAMS)

NET WT.	.1972	.0076	.0093	.0089	.0075	.0034	0
PERCENT	84.3	3.25	3.98	3.80	3.20	1.45	0

TOTAL NET WEIGHT 233.9 mgm

KVB

BRINK CASCADE IMPACTOR DATA REDUCTION

TEST NO. 24

TEST SITE Site F

TEST DATE 2/6/79

SAMPLE LOCATION Econ. Out

LOAD 100 %

% O_2 6.3

FUEL Pennsylvania Bit.

SPECIAL CONDITIONS Low O_2 High OFA

ρp - Density of particles 2.5 g/cm^3

μ - Viscosity of flue gas 2.4×10^{-4} poise

MWs - Molecular wt. flue gas 29.4 g/g mole

ΔP_I - Pressure drop across impactor 6.0 in H_2O

Ps - Absolute stack pressure 29.59 in. Hg

Ts - Absolute stack temperature 830 °R

Qs - Actual flow rate at stack conditions 0.0639 ft^3/min

Vm - Dry gas volume 3.409 SCF

Mn - Total particulate mass 282.2 mgm

Cn - Total concentration 1.278 $\frac{grains}{SCF}$

I - Percent isokinetics 126 %

Vs - Gas velocity 31.30 ft/sec.

Dn - Nozzle diameter 0.079 in.

Stage Number	CYCLONE	1	2	3	4	5	FINAL FILTER
Dj - Jet Diameter, cm		0.2490	0.1775	0.1396	0.0946	0.0731	
Fj - Press. factor, n.d.		0.0210	0.0273	0.0395	0.0903	0.3277	
$D_{S,\overline{50}}$ Stokes diameter, μm		3.01	1.75	1.18	0.59	0.35	
$D_{A,\overline{50}}$ Aerodynamic diameter, μm		4.86	2.86	1.95	1.02	0.64	
$D_{AI,\overline{50}}$ Aerodynamic impaction diameter, μm		5.02	3.02	2.11	1.17	0.80	
Mn - Particulate mass, mgm	265.4	2.8	10.5	1.3	1.2	1.0	0.0
% - Percent of Total	94.0	1.0	3.7	0.5	0.4	0.4	0.0
Cumulative percent	6.0	5.0	1.3	0.8	0.4	0.0	
Cn - Concentration, grains/SCF	1.202	0.013	0.048	0.006	0.005	0.005	0.000
Cumulative concentration, grains/SCF	1.202	1.215	1.263	1.269	1.274	1.279	1.279

KVB

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 24

LOAD 100 %

TEST SITE Site F

% O_2 6.3

TEST DATE 2/6/79

FUEL Pennsylvania Bit.

SAMPLE LOCATION Econ. Out

SPECIAL CONDITIONS Low O_2 High OFA

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP 0.20

BAROMETRIC PRESS in. Hg, P_{bar} 29.80

GAS TEMP. °R, Ts 830

GAS STATIC PRESS in. H_2O −2.8

PITOT CORRECTION FACTOR, Cp 0.837

GAS STATIC PRESS in. Hg abs., Ps 29.59

MOLECULAR WT. FLUE GAS, MW_s 29.4

$$V_s = 85.48\ C_p \left(\frac{T_s\ \Delta P}{P_s\ MW_s}\right)^{1/2} = 31.30 \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, Dn 0.079

NOZZLE AREA ft^2, An 3.404×10^{-5} $An = \pi(Dn/24)^2$

$Qn = Vs\ An\ 60 = 6.393 \times 10^{-2}$ ft^3/min at nozzle

$Qc = Qs \left(\frac{PsMWs}{1.3Ts}\right)^{1/2} = 0.05174$ ft^3/min corrected to calibration conditions

PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE 6.0 in. H_2O

OPERATING VACUUM (corrected for static pressure of duct) 8.8 in. H_2O

ISOKINETICS DETERMINATION

	SAMPLE TIME (θ)	METER READING (Vm)	METER TEMP (Tm)
INITIAL	12:22	331.308	88 °F
FINAL	13:30	334.717	92 °F
Δ	68	3.409	90 °F

$\%H_2O$ = 5 %

$$I = \frac{1.667\ T_s\ V_m\ P_{bar}}{\theta\ T_m\ V_s\ P_s\ A_n(1-\frac{\%H_2O}{100})} = 126\ \%$$

KVB

BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 24

LOCATION ABMA F / ECONOMIZER OUTLET

TEST DATE 2-6-79

ENGINEER TIDONA

TEST DESCRIPTION BRINK & PARTICULATES AT 100% LOAD, OPT. O_2 + OPT. OFA

PRE TEST WEIGHTS (GRAMS)

PLATE NO.		CYCLONE BEAKER "A"	1	2	3	4	5	FINAL FILTER
DATE WT.		2-6-79	2-6-79	2-6-79	2-6-79	2-6-79	2-6-79	2-6-79
TARE WT.	1	~~100.8353~~	3.6606	3.3507	3.7349	3.2820	3.7550	0.0376
	2	100.8362	3.6604	3.3507	3.7347	3.2822	3.7553	0.0376
	3	100.8365	3.6602	3.3504	3.7346	3.2819	3.7553	0.0373
	4	100.8360						
AVERAGE		100.8362	3.6604	3.3506	3.7347	3.2820	3.7552	0.0375

POST TEST WEIGHTS (GRAMS)

DATE WT.		2-8-79	2-7-79	2-7-79	2-7-79	2-7-79	2-7-79	2-7-79
GROSS WT.	1	101.1016	~~3.6641~~	3.3613	~~3.7367~~	3.2833	3.7564	0.0375
	2	101.1014	3.6635	3.3610	3.7359	3.2831	3.7561	0.0375
	3	101.1018	3.6631	3.3610	3.7358	3.2832	3.7561	0.0375
	4		3.6631		3.7363			
AVERAGE		101.1016	3.6632	3.3611	3.7360	3.2832	3.7562	0.0375

NET TEST RESULTS (MILLIGRAMS)

NET WT.	0.2654	0.0028	0.0105	0.0013	0.0012	0.0010	0.0000
PERCENT	94.05	0.99	3.72	0.46	0.43	0.35	0

TOTAL NET WEIGHT 282.2 mgm

KVB

BRINK CASCADE IMPACTOR DATA REDUCTION

TEST NO. 29
TEST SITE Site F
TEST DATE 2/12/79
SAMPLE LOCATION Econ. Out

LOAD 100 %
% O_2 6.4
FUEL Coal B
SPECIAL CONDITIONS Optimum O_2 + OFA

ρp - Density of particles 2.5 g/cm^3
μ - Viscosity of flue gas 2.0 $\times 10^{-4}$ poise
MWs - Molecular wt. flue gas 29.4 g/g mole
ΔP_I - Pressure drop across impactor 5.6 in H_2O
Ps - Absolute stack pressure 29.64 in. Hg
Ts - Absolute stack temperature 840 °R
Qs - Actual flow rate at stack conditions 6.09 $\times 10^{-2}$ ft^3/min

Vm - Dry gas volume 3.075 SCF
Mn - Total particulate mass 396.5 mgm
Cn - Total concentration 1.991 grains/SCF
I - Percent isokinetics 128 %
Vs - Gas velocity 29.80 ft/sec.
Dn - Nozzle diameter 0.079 in.

Stage Number	CYCLONE	1	2	3	4	5	FINAL FILTER
Dj - Jet Diameter, cm		0.2490	0.1775	0.1396	0.0946	0.0731	
Fj - Press. factor, n.d.		0.0210	0.0273	0.0395	0.0903	0.3277	
$D_{s,50}$ Stokes diameter, μm		2.83	1.65	1.11	0.57	0.34	
$D_{A,50}$ Aerodynamic diameter, μm		4.56	2.69	1.84	0.97	0.61	
$D_{AI,50}$ Aerodynamic impaction diameter, μm		4.69	2.82	1.97	1.10	0.75	
Mn - Particulate mass, mgm	366.5	5.8	11.6	5.4	4.1	2.0	1.1
% - Percent of Total	92.4	1.5	2.9	1.4	1.0	0.5	0.3
Cumulative percent	7.6	6.1	3.2	1.8	0.8	0.3	
Cn - Concentration, grains/SCF	1.840	0.029	0.058	0.027	0.021	0.010	0.006
Cumulative concentration, grains/SCF	1.840	1.869	1.927	1.954	1.975	1.985	1.991

KVB

BRINK CASCADE IMPACTOR DATA SHEET

TEST NO. 29

LOAD 100%

TEST SITE ABMA SITE F

% O_2

TEST DATE 2/12/79

FUEL Coal B

SAMPLE LOCATION Econ OUT

SPECIAL CONDITIONS

GAS VELOCITY DETERMINATION

PITOT TUBE ΔP 0.18

GAS TEMP. °R, Ts 840

PITOT CORRECTION FACTOR, Cp 837

BAROMETRIC PRESS in. Hg, P_{bar} 29.90

GAS STATIC PRESS in. H_2O −3.6

GAS STATIC PRESS in. Hg abs, Ps 29.64

MOLECULAR WT. FLUE GAS, MW_s 29.4

$$Vs = 85.48\ Cp \left(\frac{Ts\ \Delta P}{Ps\ MWs}\right)^{1/2} = 29.80 \text{ ft/sec}$$

IMPACTOR FLOW RATE DETERMINATION

NOZZLE DIAMETER inches, Dn .079

NOZZLE AREA ft^2, An 3.404×10^{-5} $An = \pi(Dn/24)^2$

$Qs = Vs\ An\ 60 = 6.087 \times 10^{-2}$ ft^3/min at nozzle

$Qc = Qs \left(\frac{PsMWs}{\underset{1.6}{\cancel{1.3}}Ts}\right)^{1/2} = 4.901 \times 10^{-2}$ ft^3/min corrected to calibration conditions

PRESSURE DROP ACROSS IMPACTOR FROM CALIBRATION CURVE 5.6 in. H_2O

OPERATING VACUUM (corrected for static pressure of duct) 8.4 in. H_2O

ISOKINETICS DETERMINATION

	SAMPLE TIME (θ)	METER READING (Vm)	METER TEMP (Tm)
INITIAL	8:20	340.930	80°F
FINAL	9:25	344.005	83°F
Δ	65	3.075	82

$\%H_2O = 5\ \%$

$$I = \frac{1.667\ Ts\ Vm\ P_{bar}}{\theta\ Tm\ Vs\ Ps\ An\left(1-\frac{\%H_2O}{100}\right)} = 128\ \%$$

KVB

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BRINK CASCADE IMPACTOR LAB WORKSHEET

TEST No. 29

LOCATION ABMA Site F

TEST DATE 2/12/79

ENGINEER T. Dona

TEST DESCRIPTION OPT. O_2 +OFA – Coal B

PRE TEST WEIGHTS (GRAMS)

Beaker # 16

PLATE NO.		CYCLONE	1	2	3	4	5	FINAL FILTER
DATE WT.		2/11/79	2/11/79	2/11/79	2/11/79	2/11/79	2/11/79	2/9/79
TARE WT.	1	98.7384	3.6617	3.3511	3.7346	3.2824	3.7557	.0384
	2	98.7380	3.6617	3.3511	3.7347	3.2826	3.7553	.0384
	3	98.7381	3.6617	3.3511	3.7345	3.2825	3.7552	.0384
	4		—	—	—	—	—	—
AVERAGE		98.7382	3.6617	3.3511	3.7346	3.2825	3.7554	.0384

POST TEST WEIGHTS (GRAMS)

DATE WT.		2/15/79	2/15/79	2/15/79	2/15/79	2/15/79	2/15/79	2/11/79
GROSS WT.	1	99.1048	3.6668	3.3628	3.7400	3.2866	3.7574	.0396
	2	99.1048	3.6673	3.3628	3.7401	3.2866	3.7574	.0394
	3	99.1044	3.6674	3.3626	3.7399	3.2866	3.7573	.0394
	4							
AVERAGE		99.1047	3.6675	3.3627	3.7400	3.2866	3.7574	0.0395

NET TEST RESULTS (MILLIGRAMS)

NET WT.	0.3665	0.0058	0.0116	0.0054	0.0041	0.0020	0.0011
PERCENT	92.43	1.46	2.93	1.36	1.03	0.50	0.28

TOTAL NET WEIGHT 0.3965 mgm

SITE F

SASS GRAVIMETRICS

Test 22	10μ	89.4199	9.81% Passing
	3μ	6.3749	3.38% Passing
	1μ	0.9482	2.42% Passing
	Filter	2.4037	
	TOTAL	99.1467	

Test 30	10μ	74.9933	12.86% Passing
	3μ	7.1511	4.55% Passing
	1μ	1.2138	3.14% Passing
	Filter	2.7016	
	TOTAL	86.0598	

KVB
6990-01
July 12, 1979

Sample No.	K-23138	K-23139	K-23140
Sample Description	Fly Ash F-5 12/19/78	Fly Ash F-21 1/24/79	Fly Ash F-23 2/1/79
Bahco Particle Size Determination			
% Through #100 (149 Microns)	33.8	18.2	17.3

Results:	Terminal Velocity	Diameter (Microns)	%Smaller	Diameter (Microns)	%Smaller	Diameter (Microns)	%Smaller
	112.	26.	19.7	24.	5.6	24.	5.5
	79.	22.	17.4	21.	4.7	20.	4.8
	31.	14.	12.7	13.	3.2	13.	3.4
	12.3	8.8	7.4	8.1	2.0	8.0	2.4
	4.15	5.1	3.6	4.7	1.3	4.7	1.7
	0.96	2.4	1.3	2.3	0.8	2.2	1.0
	0.35	1.5	0.3	1.4	0.4	1.4	0.5

Density, gms/cc (On #100 mesh Material Only)	2.23	2.61	2.64
Screen Sizing			
% Through #10	100.0	100.0	100.0
16	98.5	97.8	95.8
30	79.6	67.7	60.4
50	54.3	37.6	34.3
100	33.8	18.2	17.3
200	16.3	5.1	5.3
325	8.3	2.4	2.6

KVB
6990-01
July 12, 1979

Sample No.	K-23141	K-23142
Description	Fly Ash F-24 2/6/79	Fly Ash F-29 2/12/79

Bahco Particle Size Determination

	K-23141	K-23142
% Through #100 (149 Microns)	16.1	16.0

Results:

Terminal Velocity	Diameter (Microns)	%Smaller	Diameter (Microns)	%Smaller
112.	25.	6.1	26.	6.8
79.	21.	5.3	22.	6.0
31.	13.	3.4	14.	4.5
12.3	8.4	2.6	8.8	3.1
4.15	4.9	1.7	5.1	2.1
0.96	2.3	1.0	2.4	1.1
0.35	1.4	0.6	1.5	0.5

	K-23141	K-23142
Density, gms/cc (On #100 Mesh Material Only)	2.44	2.23

Screen Sizing

% Through	K-23141	K-23142
#10	100.0	100.0
16	97.8	98.2
30	64.1	68.8
50	33.1	35.4
100	16.1	16.0
200	5.0	4.7
325	2.4	2.8

SECTION 5.0
FUEL AND ASH ANALYSIS

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F-462

field

COMMERCIAL TESTING & ENGINEERING CO.

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CTE
SINCE 1908

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #5

Kind of sample reported to us	Coal
Sample taken at	----
Sample taken by	KVB, Inc.
Date sampled	12/19/78
Date received	2/22/79

Analysis report no. 71- 28163

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	4.80	xxxxx
% Ash	10.80	11.34
% Volatile	14.03	14.74
% Fixed Carbon	70.37	73.92
	100.00	100.00
Btu/lb.	13145	13808
% Sulfur	1.34	1.41

FUSION TEMPERATURE OF ASH

	Reducing	Oxidizing
Initial Deformation	xxx °F	xxx °F
Softening (H=W)	xxx °F	xxx °F
Softening (H=½W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

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COMMERCIAL TESTING & ENGINEERING CO.
GENERAL OFFICES: 228 NORTH LA SALLE STREET, CHICAGO, ILLINOIS 60601 · AREA CODE 312 726-8434

PLEASE ADDRESS ALL CORRESPONDENCE TO:
16130 VAN DRUNEN RD., SOUTH HOLLAND, IL 60473
OFFICE TEL. (312) 264-1173

CTE
SINCE 1908

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #15

Kind of sample reported to us	Coal
Sample taken at	----
Sample taken by	KVB, Inc.
Date sampled	1/8/79
Date received	2/22/79

Analysis report no. 71- 28165

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	5.69	xxxxx
% Ash	10.96	11.62
% Volatile	22.86	24.24
% Fixed Carbon	60.49	64.14
	100.00	100.00
Btu/lb.	12975	13758
% Sulfur	1.20	1.27

FUSION TEMPERATURE OF ASH

	Reducing	Oxidizing
Initial Deformation	xxx °F	xxx °F
Softening (H=W)	xxx °F	xxx °F
Softening (H=½W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

ABMA Test Site "F"
Test #17

Kind of sample reported to us	Coal
Sample taken at	----
Sample taken by	KVB, Inc.
Date sampled	1/10/79
Date received	2/22/79

Analysis report no. 71- 28167

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	5.26	xxxxx
% Ash	9.69	10.23
% Volatile	23.86	25.18
% Fixed Carbon	61.19	64.59
	100.00	100.00
Btu/lb.	13223	13957
% Sulfur	1.24	1.31

FUSION TEMPERATURE OF ASH

	Reducing	Oxidizing
Initial Deformation	xxx °F	xxx °F
Softening (H=W)	xxx °F	xxx °F
Softening (H=½W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L A Houser
R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #18

Kind of sample reported to us: Coal
Sample taken at: ----
Sample taken by: KVB, Inc.
Date sampled: 1/15/79
Date received: 2/22/79

Analysis report no. 71- 28169

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	5.58	xxxxx
% Ash	12.50	13.24
% Volatile	22.66	24.00
% Fixed Carbon	59.26	62.76
	100.00	100.00
Btu/lb.	12649	13396
% Sulfur	1.43	1.51

FUSION TEMPERATURE OF ASH

	Reducing	Oxidizing
Initial Deformation	xxx °F	xxx °F
Softening (H=W)	xxx °F	xxx °F
Softening (H=½W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #19

Kind of sample reported to us	Coal
Sample taken at	----
Sample taken by	KVB, Inc.
Date sampled	1/16/79
Date received	2/22/79

Analysis report no. 71- 28171

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	7.76	xxxxx
% Ash	11.08	12.01
% Volatile	22.45	24.34
% Fixed Carbon	58.71	63.65
	100.00	100.00
Btu/lb.	12501	13553
% Sulfur	1.35	1.46

FUSION TEMPERATURE OF ASH

	Reducing	Oxidizing
Initial Deformation	xxx °F	xxx °F
Softening (H = W)	xxx °F	xxx °F
Softening (H = ½W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R A Houser
R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

ABMA Test Site "F"
Test #20

Kind of sample reported to us	Coal
Sample taken at	----
Sample taken by	KVB, Inc.
Date sampled	1/17/79
Date received	2/22/79

Analysis report no. 71- 28173

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	2.26	xxxxx
% Ash	8.43	8.62
% Volatile	25.22	25.80
% Fixed Carbon	64.09	65.58
	100.00	100.00
Btu/lb.	13813	14132
% Sulfur	1.61	1.65

FUSION TEMPERATURE OF ASH

	Reducing	Oxidizing
Initial Deformation	xxx °F	xxx °F
Softening (H=W)	xxx °F	xxx °F
Softening (H=½W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #21

Kind of sample reported to us	Coal
Sample taken at	----
Sample taken by	KVB, Inc.
Date sampled	1/24/79
Date received	2/22/79

Analysis report no. 71- 28175

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	1.99	xxxxx
% Ash	11.15	11.38
% Volatile	62.87	64.15
% Fixed Carbon	23.99	24.47
	100.00	100.00
Btu/lb.	13347	13618
% Sulfur	1.85	1.89

FUSION TEMPERATURE OF ASH

	Reducing	Oxidizing
Initial Deformation	xxx °F	xxx °F
Softening (H = W)	xxx °F	xxx °F
Softening (H = ½W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R A Houser

R. A. HOUSER, Manager, Midwest Division

Charter Member

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Kind of sample reported to us	Coal
Sample taken at	----
Sample taken by	KVB, Inc.
Date sampled	1/31/79
Date received	2/22/79

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #22

Analysis report no. 71- 28186

PROXIMATE ANALYSIS	As received	Dry basis
% Moisture	3.13	xxxxx
% Ash	9.44	9.74
% Volatile	23.58	24.34
% Fixed Carbon	63.85	65.92
	100.00	100.00
Btu/lb.	13627	14067
% Sulfur	1.51	1.56
% Alk. as Na_2O	xxxxx	0.14
SULFUR FORMS		
% Pyritic Sulfur	0.83	0.86
% Sulfate Sulfur	0.00	0.00
% Organic Sulfur	0.68	0.70
WATER SOLUBLE ALKALIES		
% Na_2O =	xxxxx	xxxx
% K_2O =	xxxxx	xxxx

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2420 °F	xxxx °F
Softening (H=W) H is Cone Height	2600 °F	xxxx °F
Softening (H=½W) W is Cone Width	2650 °F	xxxx °F
Fluid	2700+ °F	xxxx °F

% EQUILIBRIUM MOISTURE = xxxx
HARDGROVE GRINDABILITY INDEX = 96
FREE SWELLING INDEX = 9

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	3.13	xxxxx
Carbon	76.57	79.04
Hydrogen	4.69	4.84
Nitrogen	1.26	1.30
Chlorine	0.15	0.15
Sulfur	1.51	1.56
Ash	9.44	9.74
Oxygen (diff)	3.25	3.37
	100.00	100.00

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	41.47
Alumina, Al_2O_3	32.72
Titania, TiO_2	1.23
Ferric oxide, Fe_2O_3	16.23
Lime, CaO	2.52
Magnesia, MgO	0.64
Potassium oxide, K_2O	1.59
Sodium oxide, Na_2O	0.35
Sulfur trioxide, SO_3	2.00
Phos. pentoxide, P_2O_5	0.82
Undetermined	0.28*
	100.00
SILICA VALUE =	68.14
BASE: ACID RATIO	0.28
T_{250} Temperature =	2575 °F

*These ignited basis results were used
to calculate undetermined value above
%Strontium oxide, SrO 0.04
%Barium oxide, BaO 0.09
%Manganese oxide, Mn_3O_4 .... 0.02

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

RAHouser

R. A. HOUSER, Manager, Midwest Division

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Charter Member

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OFFICE TEL. (312) 264-1173

SINCE 1908

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #23

Kind of sample reported to us	Coal
Sample taken at	----
Sample taken by	KVB, Inc.
Date sampled	2/1/79
Date received	2/22/79

Analysis report no. 71- 28177

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	2.28	xxxxx
% Ash	9.45	9.67
% Volatile	24.20	24.76
% Fixed Carbon	64.07	65.57
	100.00	100.00
Btu/lb.	13750	14071
% Sulfur	1.66	1.70

FUSION TEMPERATURE OF ASH

	Reducing	Oxidizing
Initial Deformation	xxx °F	xxx °F
Softening (H=W)	xxx °F	xxx °F
Softening (H=½W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #23A

Kind of sample reported to us	Coal
Sample taken at	----
Sample taken by	KVB, Inc.
Date sampled	2/8/79
Date received	2/22/79

Analysis report no. 71- 28181

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	2.51	xxxxx
% Ash	11.01	11.29
% Volatile	23.92	24.54
% Fixed Carbon	62.56	64.17
	100.00	100.00
Btu/lb.	13467	13814
% Sulfur	1.67	1.71

FUSION TEMPERATURE OF ASH

	Reducing	Oxidizing
Initial Deformation	xxx °F	xxx °F
Softening (H=W)	xxx °F	xxx °F
Softening (H=½W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

171 R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Kind of sample reported to us	Coal
Sample taken at	----
Sample taken by	KVB, Inc.
Date sampled	2/7/79
Date received	2/22/79

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #24

Analysis report no. 71- 28189

PROXIMATE ANALYSIS	As received	Dry basis
% Moisture	3.42	xxxxx
% Ash	11.59	12.00
% Volatile	23.32	24.15
% Fixed Carbon	61.67	63.85
	100.00	100.00
Btu/lb.	13164	13630
% Sulfur	1.32	1.37
% Alk. as Na_2O	xxxxx	0.20
SULFUR FORMS		
% Pyritic Sulfur	0.52	0.54
% Sulfate Sulfur	0.08	0.08
% Organic Sulfur	0.72	0.75
WATER SOLUBLE ALKALIES		
% Na_2O =	xxxxx	xxxx
% K_2O =	xxxxx	xxxx

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2700+ °F	xxxx °F
Softening (H=W) H is Cone Height	2700+ °F	xxxx °F
Softening (H=½W) W is Cone Width	2700+ °F	xxxx °F
Fluid	2700+ °F	xxxx °F

% EQUILIBRIUM MOISTURE = xxxx
HARDGROVE GRINDABILITY INDEX = 89
FREE SWELLING INDEX = 9

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	3.42	xxxxx
Carbon	73.70	76.31
Hydrogen	4.53	4.69
Nitrogen	1.20	1.24
Chlorine	0.14	0.15
Sulfur	1.32	1.37
Ash	11.59	12.00
Oxygen (diff)	4.10	4.24
	100.00	100.00

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	48.65
Alumina, Al_2O_3	32.14
Titania, TiO_2	1.47
Ferric oxide, Fe_2O_3	10.23
Lime, CaO	1.93
Magnesia, MgO	0.70
Potassium oxide, K_2O	2.21
Sodium oxide, Na_2O	0.23
Sulfur trioxide, SO_3	1.71
Phos. pentoxide, P_2O_5	0.41
Undetermined	0.17*
	100.00
SILICA VALUE =	79.09
BASE: ACID RATIO	0.19
T_{250} Temperature =	2735 °F

*These ignited basis results were used to calculate undetermined value above
%Strontium oxide, SrO 0.04
%Barium oxide, BaO 0.10
%Manganese oxide, Mn_3O_4 .... 0.01

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

LAHouser

R. A. HOUSER, Manager, Midwest Division

AMERICAN COUNCIL OF INDEPENDENT LABORATORIES INC.
Charter Member

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 8, 1979

Kind of sample reported to us	Coal
Sample taken at	----
Sample taken by	KVB, Inc.
Date sampled	2/12/79
Date received	2/22/79

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #29

Analysis report no. 71- 28192

PROXIMATE ANALYSIS	As received	Dry basis
% Moisture	3.54	xxxxx
% Ash	8.79	9.11
% Volatile	26.10	27.06
% Fixed Carbon	61.57	63.83
	100.00	100.00
Btu/lb.	13623	14123
% Sulfur	1.00	1.04
% Alk. as Na_2O	----	0.14
SULFUR FORMS		
% Pyritic Sulfur	0.33	0.34
% Sulfate Sulfur	0.00	0.00
% Organic Sulfur	0.67	0.70
WATER SOLUBLE ALKALIES		
% Na_2O =	----	----
% K_2O =	----	----

FUSION TEMPERATURE OF ASH	Reducing		Oxidizing	
Initial Deformation	2700+	°F	----	°F
H is Cone Height Softening (H=W)	2700+	°F	----	°F
W is Cone Width Softening (H=½W)	2700+	°F	----	°F
Fluid	2700+	°F	----	°F

% EQUILIBRIUM MOISTURE = ----

HARDGROVE GRINDABILITY INDEX = 81

FREE SWELLING INDEX = 9

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	3.54	xxxxx
Carbon	76.62	79.43
Hydrogen	4.70	4.87
Nitrogen	1.15	1.19
Chlorine	0.17	0.18
Sulfur	1.00	1.04
Ash	8.79	9.11
Oxygen (diff)	4.03	4.18
	100.00	100.00

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	47.74
Alumina, Al_2O_3	34.17
Titania, TiO_2	1.38
Ferric oxide, Fe_2O_3	9.21
Lime, CaO	1.32
Magnesia, MgO	0.57
Potassium oxide, K_2O	1.74
Sodium oxide, Na_2O	0.37
Sulfur trioxide, SO_3	1.43
Phos. pentoxide, P_2O_5	0.30
Undetermined	1.55*
	100.00
SILICA VALUE =	81.14
BASE: ACID RATIO	0.16
T_{250} Temperature =	2805 °F

*These ignited basis results were used to calculate undetermined value above

%Strontium oxide, SrO 0.10
%Barium oxide, BaO 0.12
%Manganese oxide, Mn_3O_4 .... 0.00

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R A Houser

R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Kind of sample reported to us	Coal
Sample taken at	----
Sample taken by	KVB, Inc.
Date sampled	2/13/79
Date received	2/22/79

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #30

Analysis report no. 71- 28194

PROXIMATE ANALYSIS	As received	Dry basis
% Moisture	3.84	xxxxx
% Ash	9.12	9.48
% Volatile	25.39	26.40
% Fixed Carbon	61.65	64.12
	100.00	100.00
Btu/lb.	13568	14110
% Sulfur	0.99	1.03
% Alk. as Na_2O	xxxxx	0.18
SULFUR FORMS		
% Pyritic Sulfur	0.44	0.46
% Sulfate Sulfur	0.00	0.00
% Organic Sulfur	0.55	0.57
WATER SOLUBLE ALKALIES		
% Na_2O =	xxxxx	xxxx
% K_2O =	xxxxx	xxxx

FUSION TEMPERATURE OF ASH	Reducing	Oxidizing
Initial Deformation	2700+ °F	xxxx °F
Softening (H = W)	2700+ °F	xxxx °F
Softening (H = ½W)	2700+ °F	xxxx °F
Fluid	2700+ °F	xxxx °F

H is Cone Height
W is Cone Width

% EQUILIBRIUM MOISTURE = xxxx
HARDGROVE GRINDABILITY INDEX = 84
FREE SWELLING INDEX = 9

ULTIMATE ANALYSIS	% Weight As received	% Weight Dry basis
Moisture	3.84	xxxxx
Carbon	76.09	79.13
Hydrogen	4.68	4.87
Nitrogen	1.09	1.13
Chlorine	0.17	0.18
Sulfur	0.99	1.03
Ash	9.12	9.48
Oxygen (diff)	4.02	4.18
	100.00	100.00

MINERAL ANALYSIS OF ASH	% Weight Ignited Basis
Silica, SiO_2	47.95
Alumina, Al_2O_3	32.66
Titania, TiO_2	1.46
Ferric oxide, Fe_2O_3	10.68
Lime, CaO	1.45
Magnesia, MgO	0.74
Potassium oxide, K_2O	2.15
Sodium oxide, Na_2O	0.44
Sulfur trioxide, SO_3	1.38
Phos. pentoxide, P_2O_5	0.45
Undetermined	0.36*
	100.00
SILICA VALUE =	78.84
BASE: ACID RATIO	0.19
T_{250} Temperature =	2730 °F

*These ignited basis results were used to calculate undetermined value above
%Strontium oxide, SrO 0.10
%Barium oxide, BaO 0.17
%Manganese oxide, Mn_3O_4 .... 0.01

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

L A Houser
R. A. HOUSER, Manager, Midwest Division

AMERICAN COUNCIL OF INDEPENDENT LABORATORIES, INC.
Charter Member

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OFFICE TEL. (312) 264-1173

CTE
SINCE 1908

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification
by KVB, Inc.

ABMA Test Site "F"
Test #35

Kind of sample reported to us: Coal

Sample taken at: ----

Sample taken by: KVB, Inc.

Date sampled: 2/14/79

Date received: 2/22/79

Analysis report no. 71- 28184

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	4.17	xxxxx
% Ash	10.25	10.70
% Volatile	25.54	26.65
% Fixed Carbon	60.04	62.65
	100.00	100.00
Btu/lb.	13315	13894
% Sulfur	1.01	1.05

FUSION TEMPERATURE OF ASH

	Reducing	Oxidizing
Initial Deformation	xxx °F	xxx °F
Softening (H = W)	xxx °F	xxx °F
Softening (H = ½W)	xxx °F	xxx °F
Fluid	xxx °F	xxx °F

H = Cone Height
W = Cone Width

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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175 R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us	Bottom Ash Sample	ABMA Test Site "F" Test #5
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	12/19/78	
Date received	2/22/79	

Analysis report no. 71- 28164

	DRY BASIS
%Ash	89.38
%Combustible	10.62

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us	Bottom Ash Sample	ABMA Test Site "F" Test #15
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	1/8/79	
Date received	2/22/79	

Analysis report no. 71- 28166

	DRY BASIS
%Ash	72.77
%Combustible	27.23

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R A Houser
R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us	Bottom Ash Sample	ABMA Test Site "F" Test #17
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	1/10/79	
Date received	2/22/79	

Analysis report no. 71- 28168

	DRY BASIS
%Ash	82.66
%Combustible	17.34

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #18

Kind of sample reported to us	Bottom Ash Sample
Sample taken at	-----
Sample taken by	KVB, Inc.
Date sampled	1/15/79
Date received	2/22/79

Analysis report no. 71- 28170

	DRY BASIS
%Ash....................................	91.79
%Combustible............................	8.21

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R A Houser

R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us: Bottom Ash Sample

ABMA Test Site "F"
Test #19

Sample taken at: -----

Sample taken by: KVB, Inc.

Date sampled: 1/16/79

Date received: 2/22/79

Analysis report no. 71- 28172

	DRY BASIS
%Ash	86.21
%Combustible	13.79

Respectfully submitted,
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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us	Bottom Ash Sample	ABMA Test Site "F" Test #20
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	1/17/79	
Date received	2/22/79	

Analysis report no. 71- 28174

	DRY BASIS
%Ash....................................	93.95
%Combustible............................	6.05

Respectfully submitted,
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R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us	Bottom Ash Sample	ABMA Test Site "F" Test #21
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	1/24/79	
Date received	2/22/79	

Analysis report no. 71- 28176

	DRY BASIS
%Ash	90.10
%Combustible	9.90

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. Houser

R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 8, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us: Fly Ash (Cyclone Hopper)

ABMA Test Site F
Test #22

Sample taken at: ----

Sample taken by: KVB, Inc.

Date sampled: 1/31/79

Date received: 2/22/79

Analysis report no. 71- 28188

	Dry Basis
%Ash	34.10
%Combustible	65.90
%Sulfur	0.71

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R A Houser

R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 8, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us: Bottom Ash

ABMA Test Site F
Test #22

Sample taken at: ----

Sample taken by: KVB, Inc.

Date sampled: 1/31/79

Date received: 2/22/79

Analysis report no. 71- 28187

	Dry Basis
%Ash	91.38
%Combustible	8.62
%Sulfur	0.09

Respectfully submitted,
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R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us: Bottom Ash Sample

ABMA Test Site "F"
Test #23

Sample taken at: -----

Sample taken by: KVB, Inc.

Date sampled: 2/1/79

Date received: 2/22/79

Analysis report no. 71- 28178

	DRY BASIS
%Ash....................................	90.40
%Combustible............................	9.60

Respectfully submitted,
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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us	Flyash Sample (Cyclone Hopper)	ABMA Test Site "F" Test #23
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	2/1/79	
Date received	2/22/79	

Analysis report no. 71- 28179

	DRY BASIS
%Ash	43.37
%Combustible	56.63

Respectfully submitted,
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R. A. HOUSER, [illegible] Division

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OFFICE TEL. (312) 264-1173

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by
KVB, Inc.

Kind of sample reported to us	Ash Sample (Econ. Hopper)	ABMA Test Site "F" Test #23
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	2/1/79	
Date received	2/22/79	

Analysis report no. 71- 28180

	DRY BASIS
%Ash..................................	29.65
%Combustible...........................	70.35

Respectfully submitted,
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L A Houser

R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by KVB, Inc.

ABMA Test Site "F"
Test #23A

Kind of sample reported to us	Bottom Ash Sample
Sample taken at	-----
Sample taken by	KVB, Inc.
Date sampled	2/8/79
Date received	2/22/79

Analysis report no. 71- 28182

	DRY BASIS
%Ash	88.58
%Combustible	11.42

Respectfully submitted,
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R. A. HOUSER, Manager, Midwest Division

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OFFICE TEL. (312) 264-1173

KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us: Flyash Sample (Cyclone Hopper) — ABMA Test Site "F" Test #23A

Sample taken at -----

Sample taken by KVB, Inc.

Date sampled 2/8/79

Date received 2/22/79

Analysis report no. 71- 28183

	DRY BASIS
%Ash.....................................	36.73
%Combustible.............................	63.27

Respectfully submitted,
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R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us: Bottom Ash Sample

ABMA Test Site "F"
Test #24

Sample taken at: ----

Sample taken by: KVB, Inc.

Date sampled: 2/6/79

Date received: 2/22/79

Analysis report no. 71- 28190

	DRY BASIS
%Ash....................................	86.19
%Combustible............................	13.81

Respectfully submitted,
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A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us	Fly Ash Sample (Cyclone Hopper)	ABMA Test Site "F" Test #24
Sample taken at	----	
Sample taken by	KVB, Inc.	
Date sampled	2/6/79	
Date received	2/22/79	

Analysis report no. 71- 28191

	DRY BASIS
%Ash	36.55
%Combustible	63.45

Respectfully submitted,
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A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us	Bottom Ash Sample	ABMA Test Site "F" Test #29
Sample taken at	----	
Sample taken by	KVB, Inc.	
Date sampled	2/12/79	
Date received	2/22/79	

Analysis report no. 71- 28193

	DRY BASIS
%Ash....................................	86.93
%Combustible............................	13.07

Respectfully submitted,
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R. A. Houser

R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 8, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us Bottom Ash

ABMA Test Site F
Test #30

Sample taken at ----

Sample taken by KVB, Inc.

Date sampled 2/13/79

Date received 2/22/79

Analysis report no. 71- 28195

	Dry Basis
%Ash	89.81
%Combustible	10.19
%Sulfur	0.09

Respectfully submitted,
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R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, MN 55422

March 8, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us	Fly Ash (Cyclone Hopper)	ABMA Test Site F Test #30
Sample taken at	----	
Sample taken by	KVB, Inc.	
Date sampled	2/13/79	
Date received	2/22/79	

Analysis report no. 71- 28196

	Dry Basis
%Ash	35.49
%Combustible	64.51
%Sulfur	0.43

Respectfully submitted,
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R A Houser

R. A. HOUSER, Manager, Midwest Division

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KVB, INC.
A Research-Cottrell Company
6176 Olson Memorial Highway
Minneapolis, Minnesota 55422

March 7, 1979

Sample identification by KVB, Inc.

Kind of sample reported to us	Bottom Ash Sample	ABMA Test Site "F" Test #35
Sample taken at	-----	
Sample taken by	KVB, Inc.	
Date sampled	2/14/79	
Date received	2/22/79	

Analysis report no. 71- 28185

	DRY BASIS
%Ash	86.18
%Combustible	13.82

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

R. A. HOUSER, Manager, Midwest Division

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COMBUSTIBLES DATA SHEET

SITE F

Crucible Number	Sample Origin	Crucible Weight grams	Crucible & Sample Weight Post 110°C gms	Sample Weight grams	Post 750°C grams	Δ Weight grams	% Combus-tibles
20	site F TEST #15 Econ. out 1-8-79	8.8421	10.3171	1.4756	9.2877	0.9309	63.1
		8.8416	10.3176		9.2873		
		—	—		—		
	AVG.	8.8418	10.3174		9.2875		
21	site F TEST #15 MECH OUT 1-8-79	9.4804	10.2184	0.7380	9.8340	0.3845	52.1
		9.4804	10.2185		9.8337		
		—	—		—		
	AVG.	9.4804	10.2184		9.8339		
22	Site F TEST #17 Econ. out 1-11-79	9.7274	11.4632	1.7362	10.2464	1.2171	70.1
		9.7273	11.4639		10.2463		
		—			—		
	AVG.	9.7273	11.4635		10.2464		
23	site F TEST #17 MECH OUT 1-11-79	10.1031	10.4971	0.3946	10.3198	0.1777	45.0
		10.1025	10.4976		10.3195		
		—	—		—		
	AVG.	10.1028	10.4974		10.3197		
24	Site F TEST #18 Econ. out 1-15-79	10.1189	11.4739	1.3555	10.5065	0.9678	71.4
		10.1187	11.4746		10.5065		
		—	—		—		
	AVG.	10.1188	11.4743		10.5065		
25	site F TEST #18 MECH 1-15-79	9.6896	9.9923	0.3028	9.8677	0.1250	41.3
		9.6897	9.9927		9.8673		
		—	—		—		
	AVG.	9.6897	9.9925		9.8675		
26	site F TEST #19 Econ. out 1-16-79	10.2375	11.9342	1.6971	10.7148	1.2198	71.9
		10.2374	11.9350		10.7147		
		—	—		—		
	AVG.	10.2375	11.9346		10.7148		
27	Site F TEST #19 1-16-79 MECH	9.4130	9.8848	0.4721	9.6673	0.2178	46.1
		9.4128	9.8853		9.6673		
		—	—		—		
	AVG.	9.4129	9.8851		9.6673		
28	Site F TEST #20 ECON. OUT 1-17-79	10.0589	11.0430	0.9844	10.3849	0.6587	66.9
		10.0591	11.0437		10.3845		
		—	—		—		
	AVG.	10.0590	11.0434		10.3847		
29	Site F TEST #21 MECH OUT 1-24-79	10.2787	10.7456	0.4674	10.5333	0.2128	45.5
		10.2784	10.7463		10.5331		
		—	—		—		
	AVG.	10.2786	10.7460		10.5332		
30	Site F TEST #24 MECH OUT 2-6-79	9.6552	9.9551	0.3000	9.8177	0.1375	45.8
		9.6551	9.9553		9.8177		
		—	—		—		
	AVG.	9.6552	9.9552		9.8177		

COMBUSTIBLES DATA SHEET

SITE F

TEST # 23 - MECH - [redacted] BROKEN. CONTAINER

Crucible Number	Sample Origin	Crucible Weight grams	Crucible & Sample Weight Post 110°C gms	Sample Weight grams	Post 750°C grams	Δ Weight grams	% Combus- tibles
31	TEST # 29 MECH OUT	9.6245	10.1190	0.4947	9.8864	0.2326	47.0
		9.6243	10.1191		9.8865		
		—	—		—		
	AVG.	9.6244	10.1191		9.8865		
32	TEST # 35 MECH OUT 2-15-79	8.5066	8.9766	0.4701	8.7441	0.2326	49.5
		8.5064	8.9766		8.7438		
		—	—		—		
	AVG.	8.5065	8.9766		8.7440		
33	TEST # 35 ECON. OUT 2-15-79	10.2335	11.1803	0.9469	10.4928	0.6877	72.6
		10.2332	11.1803		10.4924		
		—	—		—		
	AVG.	10.2334	11.1803		10.4926		
21	TEST # 24 Boiler Out Site F	9.6093	10.2647	0.6558	9.8254	0.4396	67.0
		9.6091	10.2653		9.8254		
	AVG.	9.6092	10.2650		9.8254		
22	TEST # 5 Boiler Out SITE F	9.3589	9.9802	0.6215	9.6727	0.3078	49.5
		9.3591	9.9807		9.6727		
	AVG.	9.3590	9.9805		9.6727		
	AVG.						
	AVG.						
	AVG.						
	AVG.						
	AVG.						
	AVG.						

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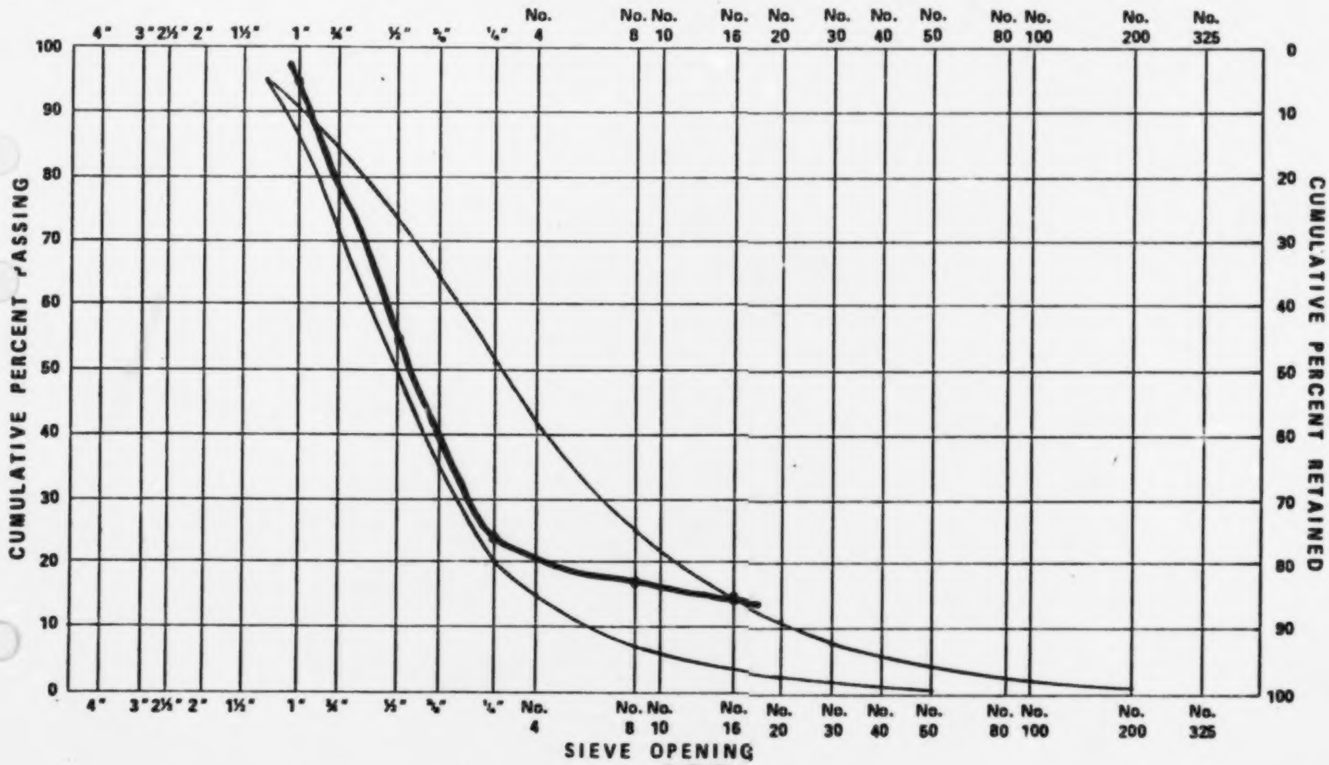
SIEVE ANALYSIS TEST REPORT

TEST NO. 15 DATE SAMPLE TAKEN 1/8/79

TEST SITE F TEST PERFORMED BY Tidona

SAMPLE IDENTIFICATION PA. BITUMINOUS COAL

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			175.0	5.18	3377.4	100	15
1"			1349.2	39.95	3202.4	94.82	minutes total
1/2"			1023.6	30.31	1853.2	54,87	shaking time
1/4"			245.6	7.27	829.6	24.56	for all screens
No. 8			86.8	2.57	584.0	17.29	↓
No. 16			497.2	14.72	497.2	14.72	



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SIEVE ANALYSIS TEST REPORT

TEST NO. 17

DATE SAMPLE TAKEN 1/10/79

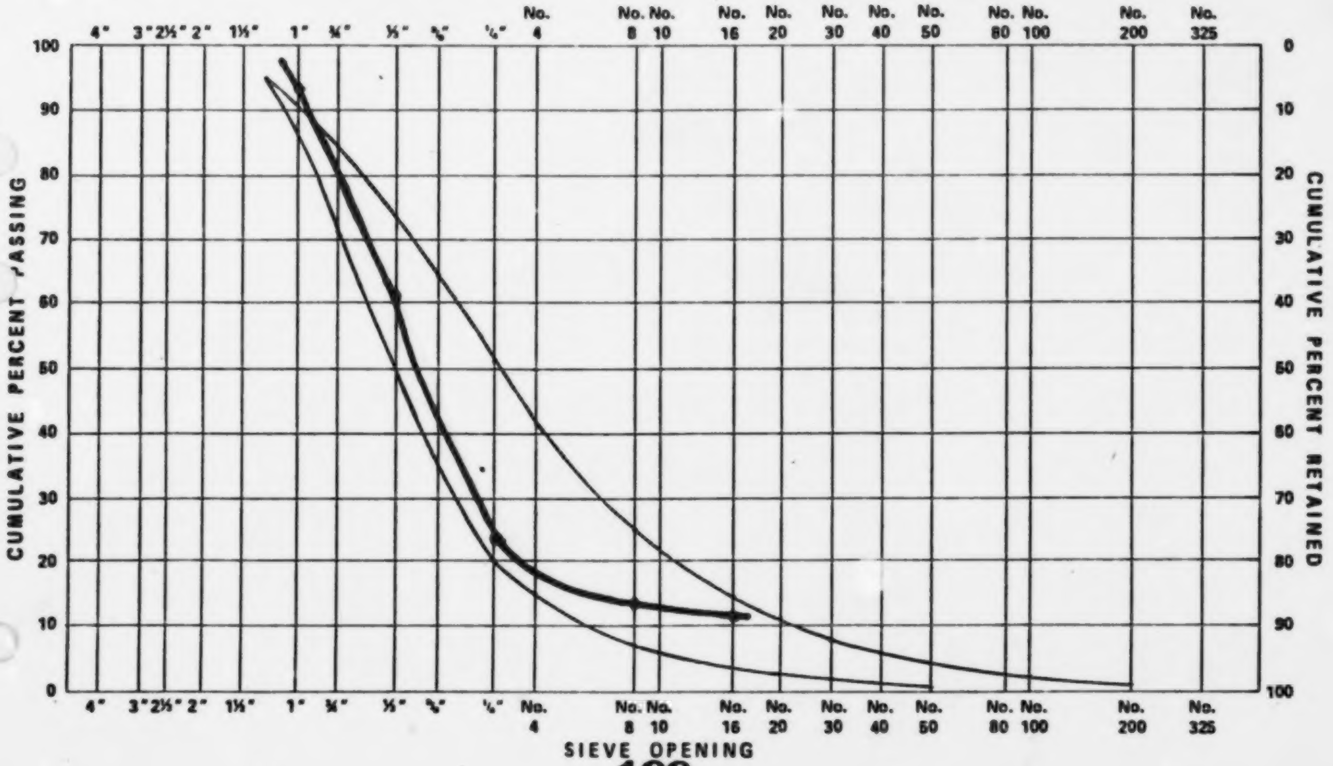
TEST SITE F

TEST PERFORMED BY Tidona

SAMPLE IDENTIFICATION Pa. Bit. Coal

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			203.0	7.0	2905.1	100.0	
1"			935.2	32.2	2702.1	93.0	1
½"			1083.2	37.3	1766.9	60.8	2
¼"			284.8	9.8	683.7	23.5	4
No. 8			82.9	2.9	398.9	13.7	8
No. 16			316.0	10.9	316.0	10.9	16

Totals = 2905.1 100.1



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SIEVE ANALYSIS TEST REPORT

TEST NO. 18

DATE SAMPLE TAKEN 1/16/79

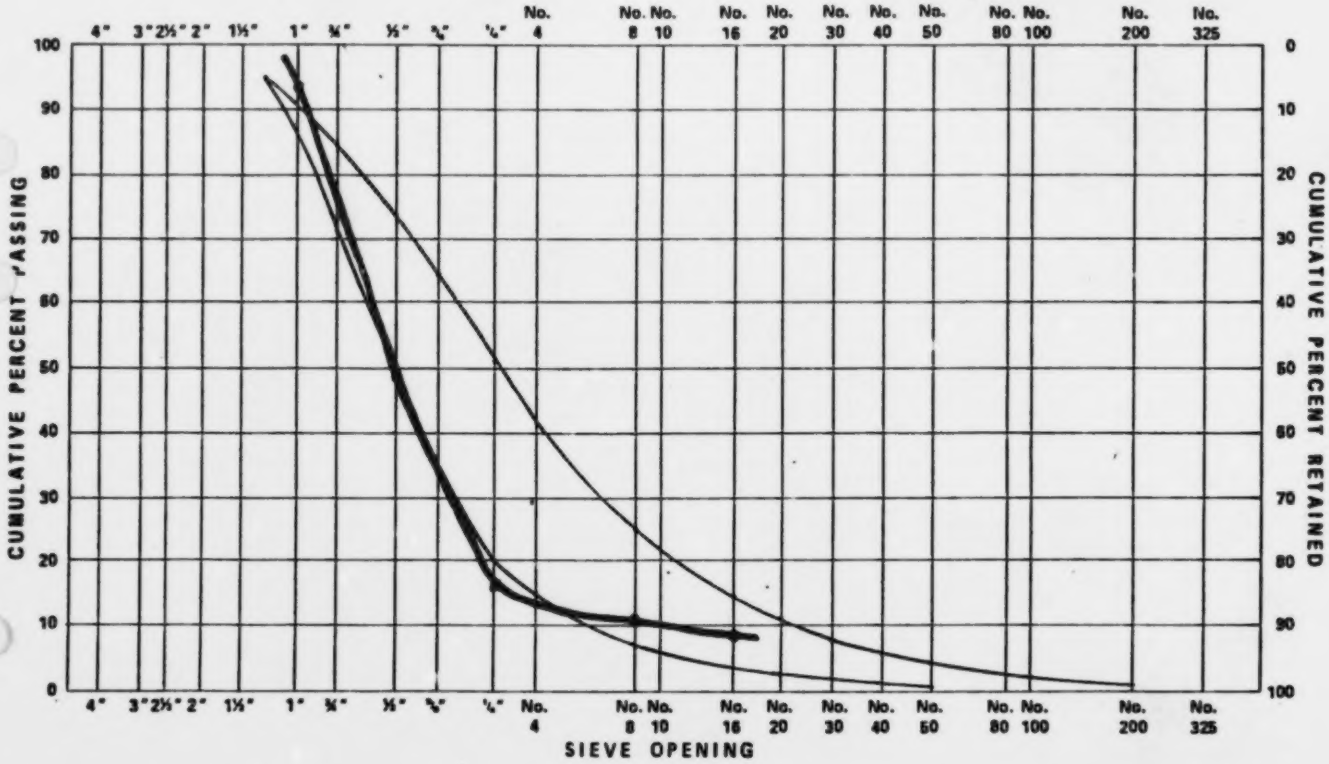
TEST SITE F

TEST PERFORMED BY Tidona

SAMPLE IDENTIFICATION Pa. Bituminous Coal

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			192.3	6.6	2906.2	100.0	
1"			1304.8	44.9	2713.9	93.4	1
1/2"			939.1	32.3	1409.1	48.5	2
1/4"			159.8	5.5	470.0	16.2	4
No. 8			48.2	1.7	310.2	10.7	8
No. 16			262.0	9.0	262.0	9.0	16

Totals = 2906.2 100.0



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SIEVE ANALYSIS TEST REPORT

TEST NO. 19

DATE SAMPLE TAKEN JAN. 16, 1979

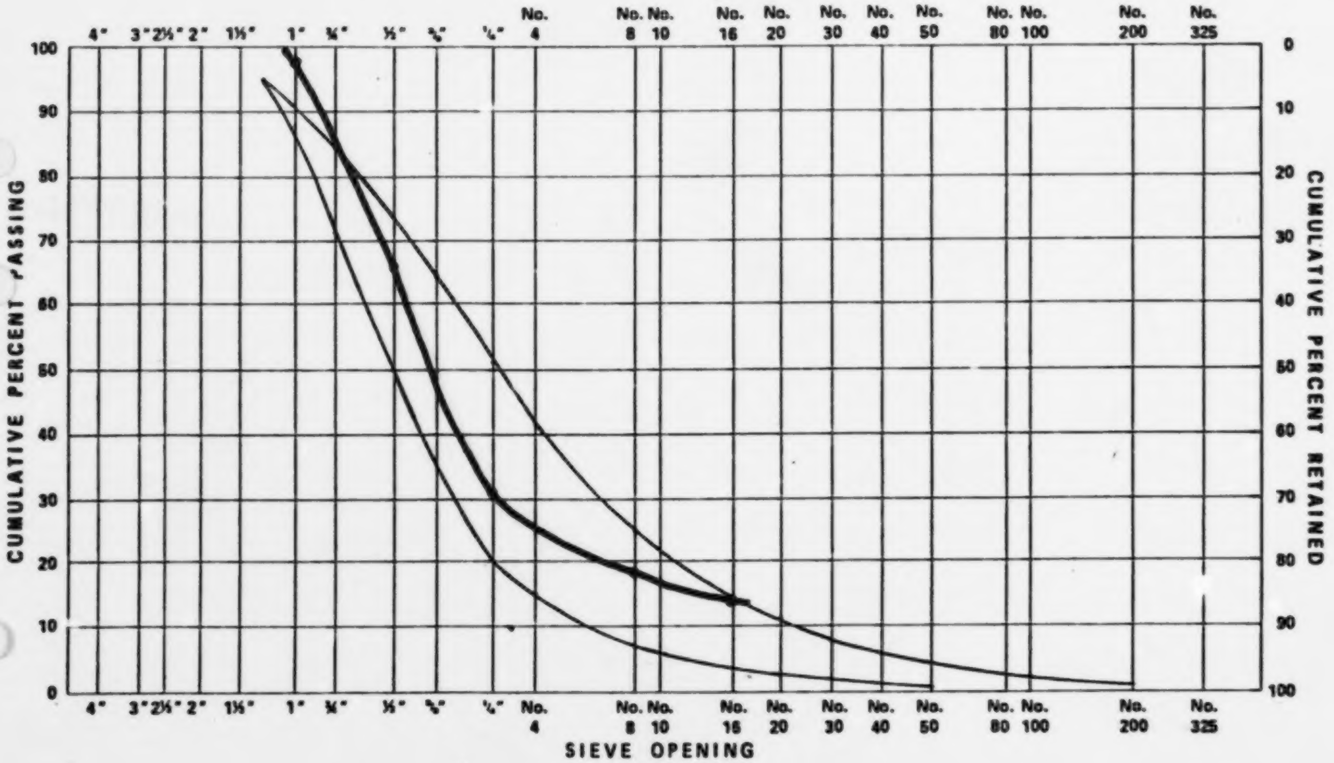
TEST SITE F

TEST PERFORMED BY Tidona

SAMPLE IDENTIFICATION Pa. Bituminous Coal

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			97.5	2.4	3991.5	100.0	0
1"			1242.6	31.1	3894.0	97.6	1
½"			1435.1	36.0	2651.4	66.4	2
¼"			467.9	11.7	1216.3	30.5	4
No. 8			180.8	4.5	748.4	18.7	8
No. 16			567.6	14.2	567.6	14.2	16

Totals = 3991.5 99.9



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SIEVE ANALYSIS TEST REPORT

TEST NO. 20

DATE SAMPLE TAKEN 1/17/79

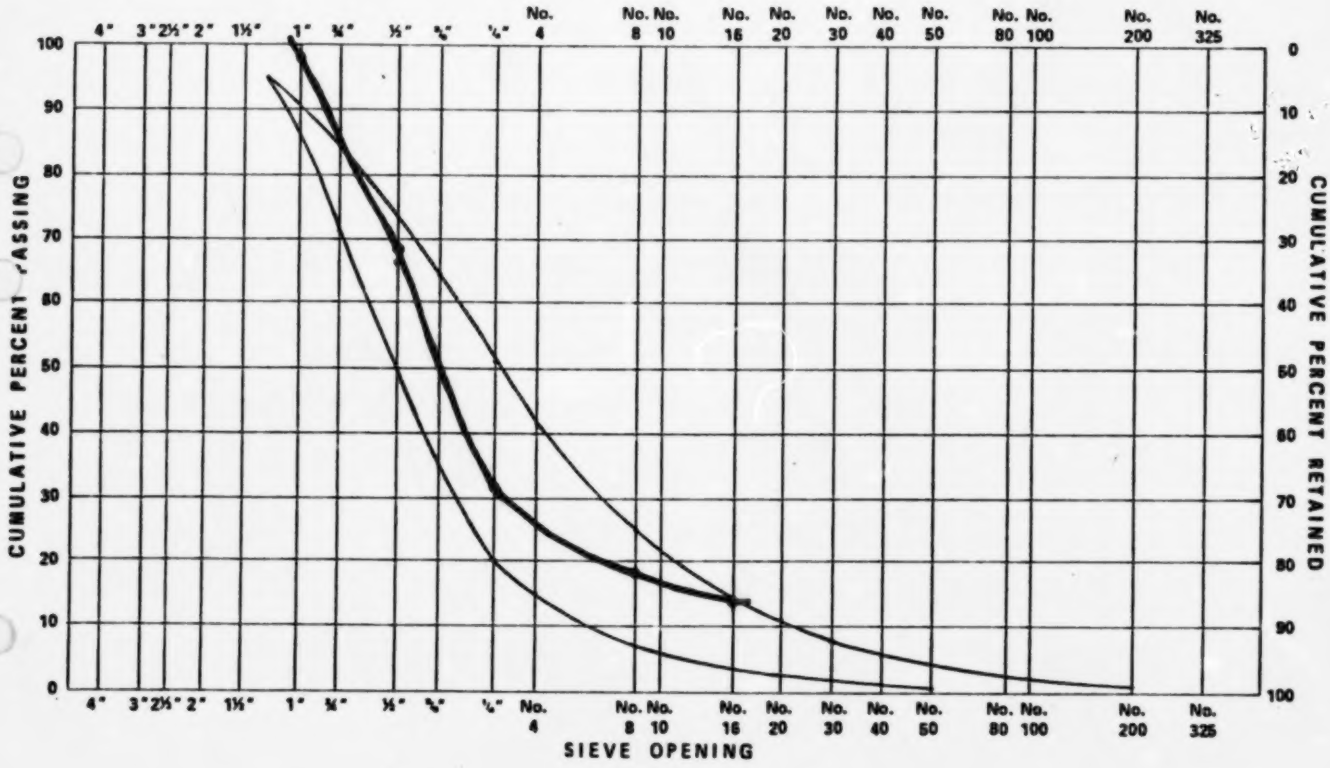
TEST SITE F

TEST PERFORMED BY T. dane

SAMPLE IDENTIFICATION Pa. Bituminous Coal

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			102.4	2.5	4138.8	100.0	0
1"			1190.4	28.8	4036.4	97.5	1
1/2"			1533.8	37.1	2846.0	68.8	2
1/4"			542.0	13.1	1312.2	31.7	4
No.8			193.1	4.7	770.2	18.6	8
No.16			577.1	13.9	577.1	13.9	16

Totals = 4138.8 100.1



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SIEVE ANALYSIS TEST REPORT

TEST NO. 21

DATE SAMPLE TAKEN 1/24/79

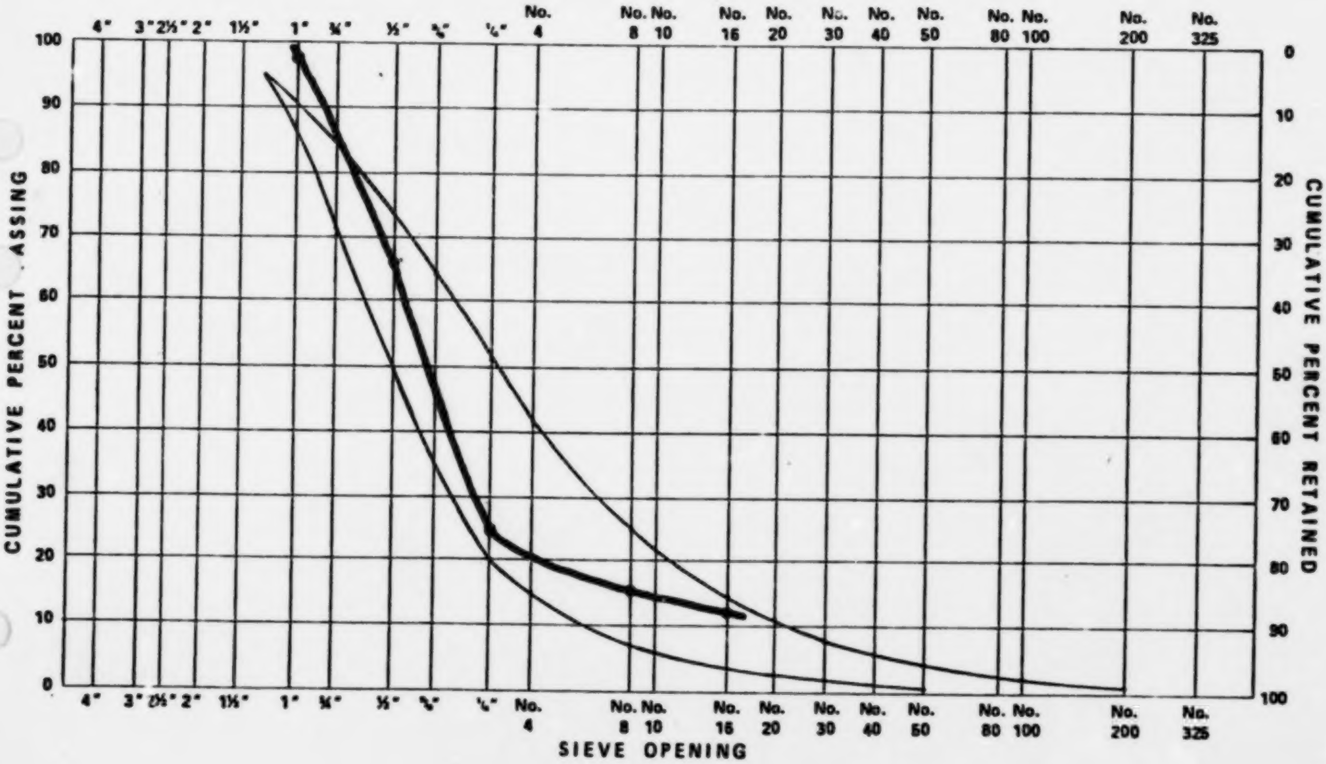
TEST SITE F

TEST PERFORMED BY Tidona

SAMPLE IDENTIFICATION Pa. Bit Coal

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			142.9	2.9	4993.1	100.0	0
1"			1549.4 -	31.0	4850.2	97.1	1
½"			1574.5 483.4 2057.9	41.2	3300.8	66.1	2
¼"			475.3	9.5	1242.9	24.9	4
No. 8			164.0	3.3	767.6	15.4	8
No. 16			603.6	12.1	603.6	12.1	16

Total = 4993.1 100.0



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SIEVE ANALYSIS TEST REPORT

TEST NO. 22

DATE SAMPLE TAKEN 1-31-79

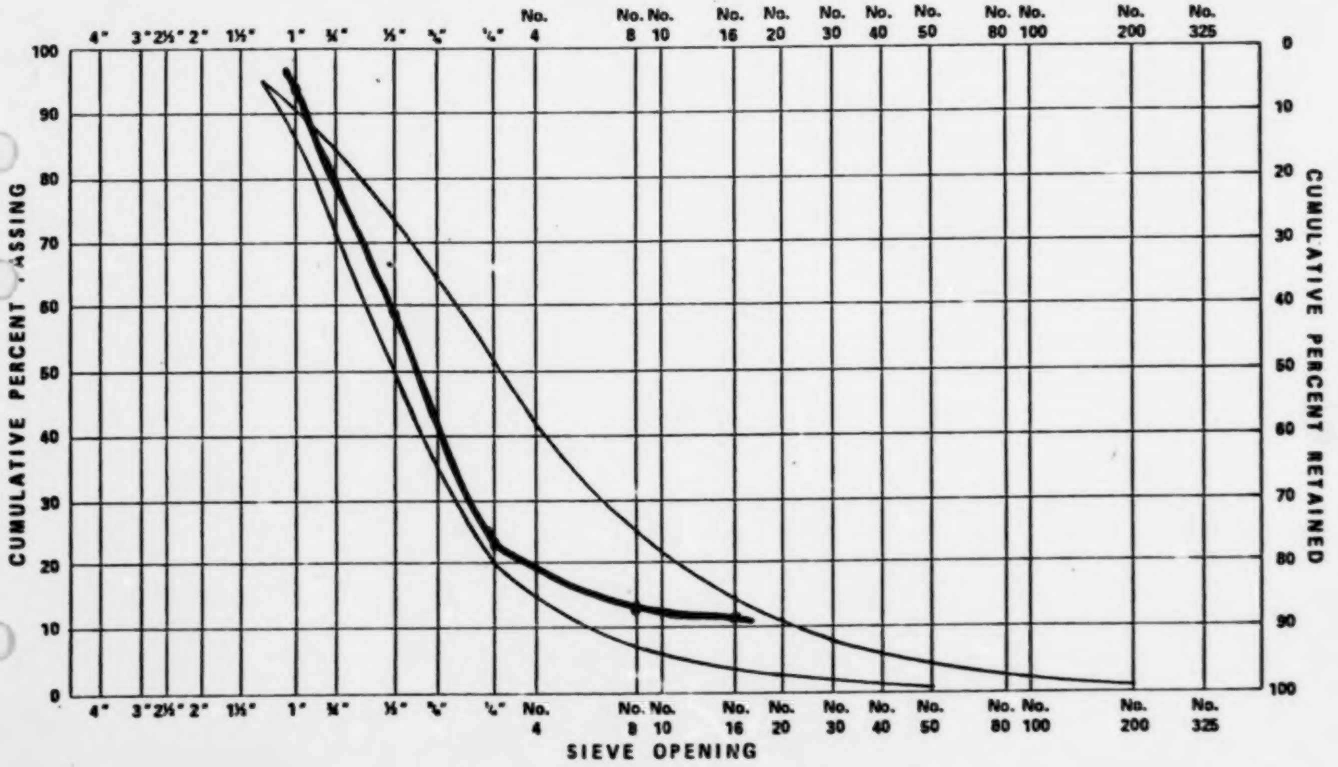
TEST SITE F

TEST PERFORMED BY Tidona

SAMPLE IDENTIFICATION Pa. Bit. Coal

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			385.4	5.8	6690.5	100.0	0
1"			1297.0 1067.2 2364.2	35.3	6305.1	94.2	1
½"			1265.3 1151.5 2416.8	36.1	3940.9	58.9	2
¼"			608.3	9.1	1524.1	22.8	4
No. 8			188.5	2.8	915.8	13.7	8
No. 16			727.3	10.9	727.3	10.9	16

Totals = 6690.5 100.0



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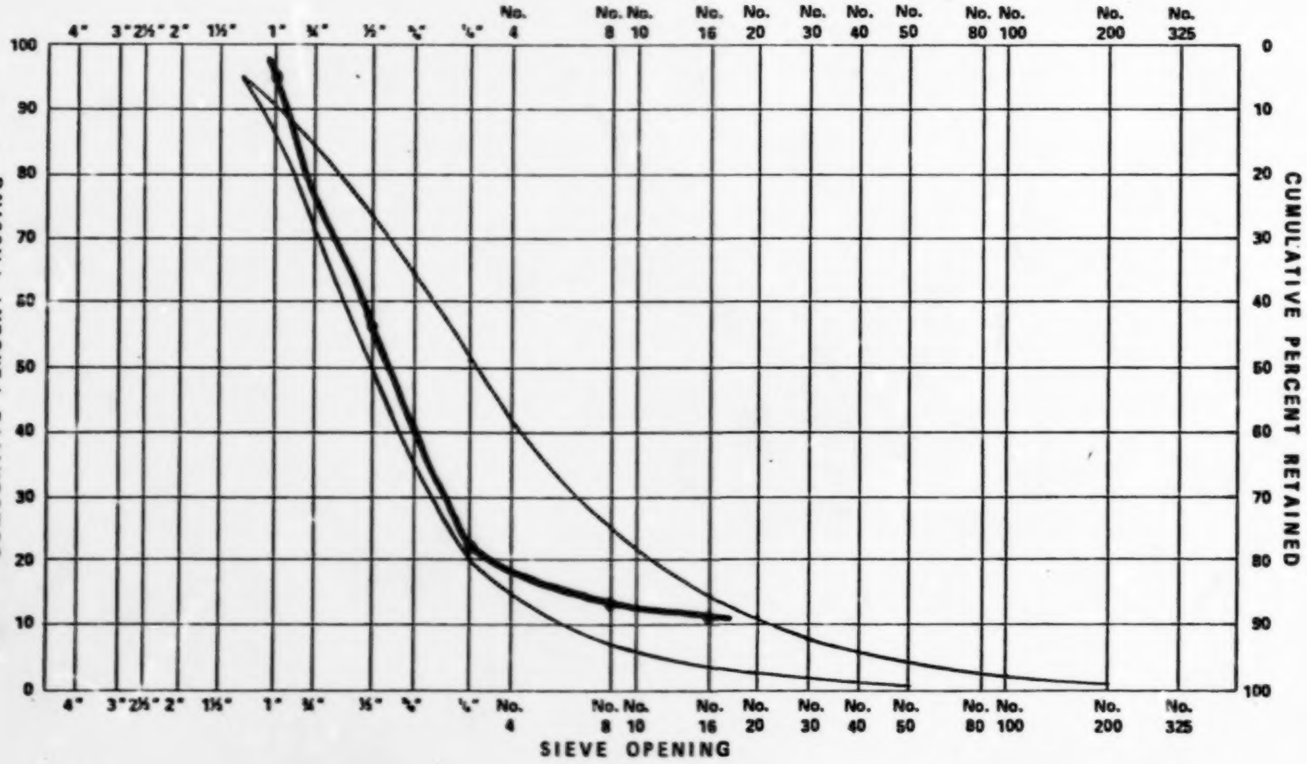
SIEVE ANALYSIS TEST REPORT

TEST NO. 23
DATE SAMPLE TAKEN 2/1/79
TEST SITE F
TEST PERFORMED BY Tidona
SAMPLE IDENTIFICATION Pa. B.t. Coal (Clearfield)

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			255.2	4.9	5241.7	100.0	0
1"			2034.1	38.8	4986.5	95.1	1
1/2"			1809.7	34.5	2952.4	56.3	2
1/4"			454.0	8.7	1142.7	21.8	4
No.8			140.5	2.7	688.7	13.1	8
No.16			548.2	10.5	548.2	10.5	16

Totals = 5241.7 100.1



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SIEVE ANALYSIS TEST REPORT

TEST NO. 23A

DATE SAMPLE TAKEN 2-8-79

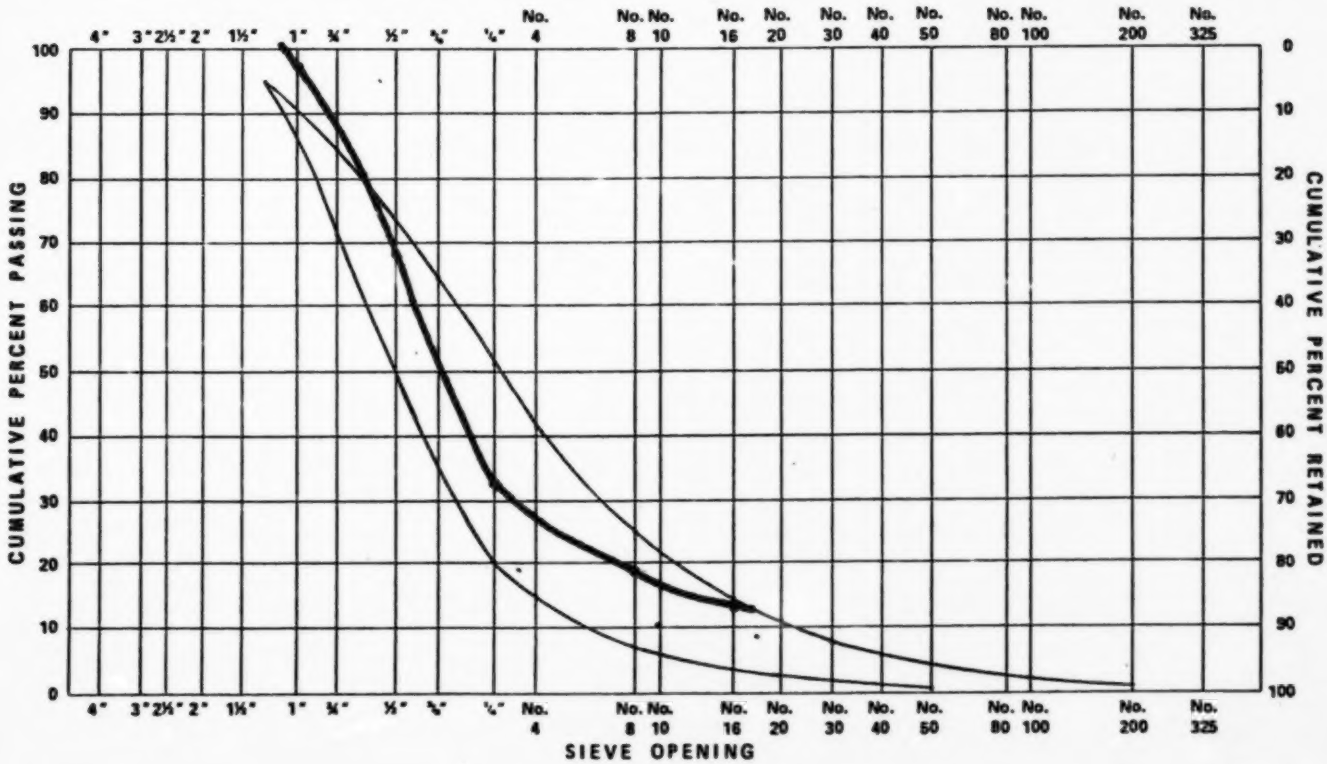
TEST SITE F

TEST PERFORMED BY Tidona

SAMPLE IDENTIFICATION Pa Bit Coal (Clearfield Co)

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
TOP			190.0	3.2	5945.4	100.0	0
1"			1708.1	287	5755.4	96.8	1
½"			1685.3 445.5 2130.8	35.8	4047.3	68.1	2
¼"			810.4	13.6	1916.5	32.2	4
No 8			282.5	4.8	1106.1	18.6	8
No 16			823.6	13.9	823.6	13.9	16

totals - 5945.4 100.0



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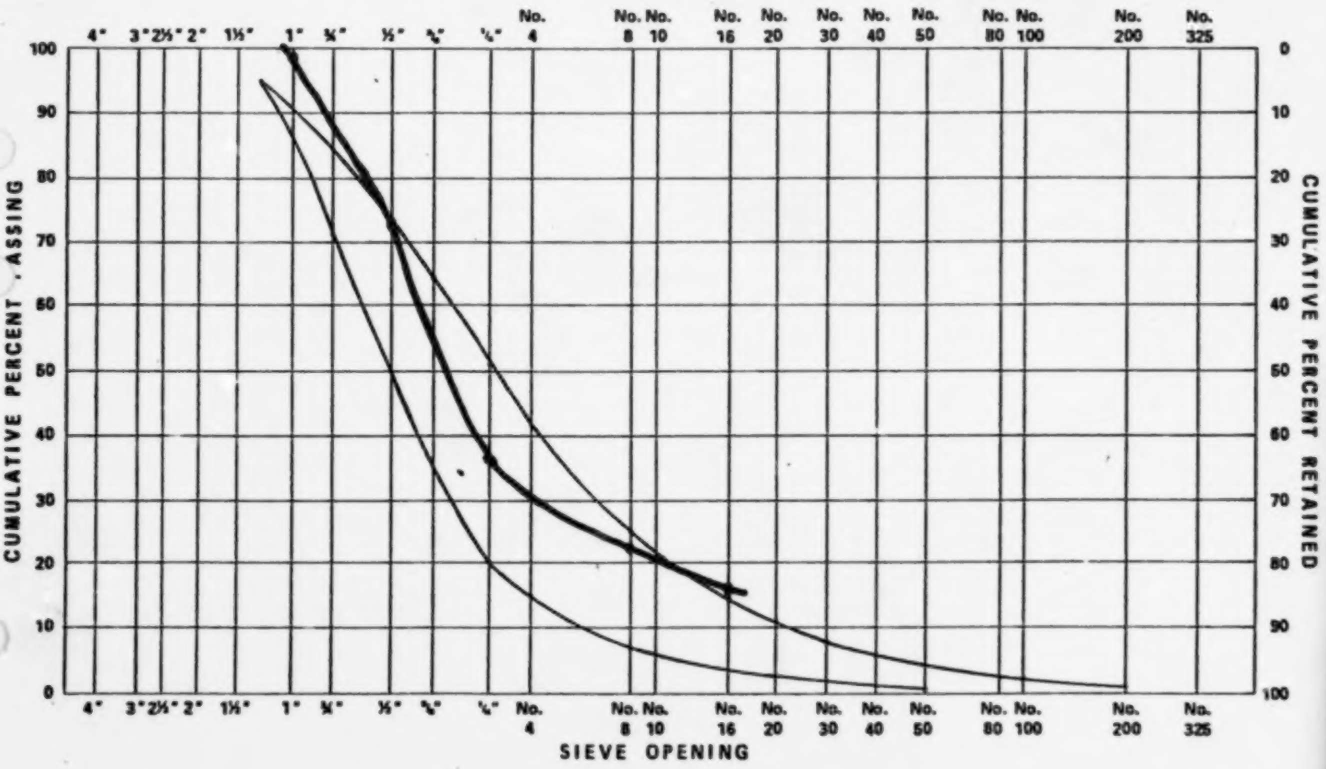
SIEVE ANALYSIS TEST REPORT

TEST NO. 24
DATE SAMPLE TAKEN 2-6-79
TEST SITE F
TEST PERFORMED BY Tidona
SAMPLE IDENTIFICATION Pa. Bit. Coal (Clearfield Co.)

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			71.2	1.5	4654.7	100.0	0
1"			1196.7	25.7	4583.5	98.5	1
½"			1061.3 617.7 1679.0	36.1	3386.8	72.8	2
¼"			713.3	15.3	1707.8	36.7	4
No. 8			265.2	5.7	994.5	21.4	8
No. 16			729.3	15.7	729.3	15.7	16

Total = 4654.7 100.0



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SIEVE ANALYSIS TEST REPORT

TEST NO. 29

DATE SAMPLE TAKEN 2-12-79

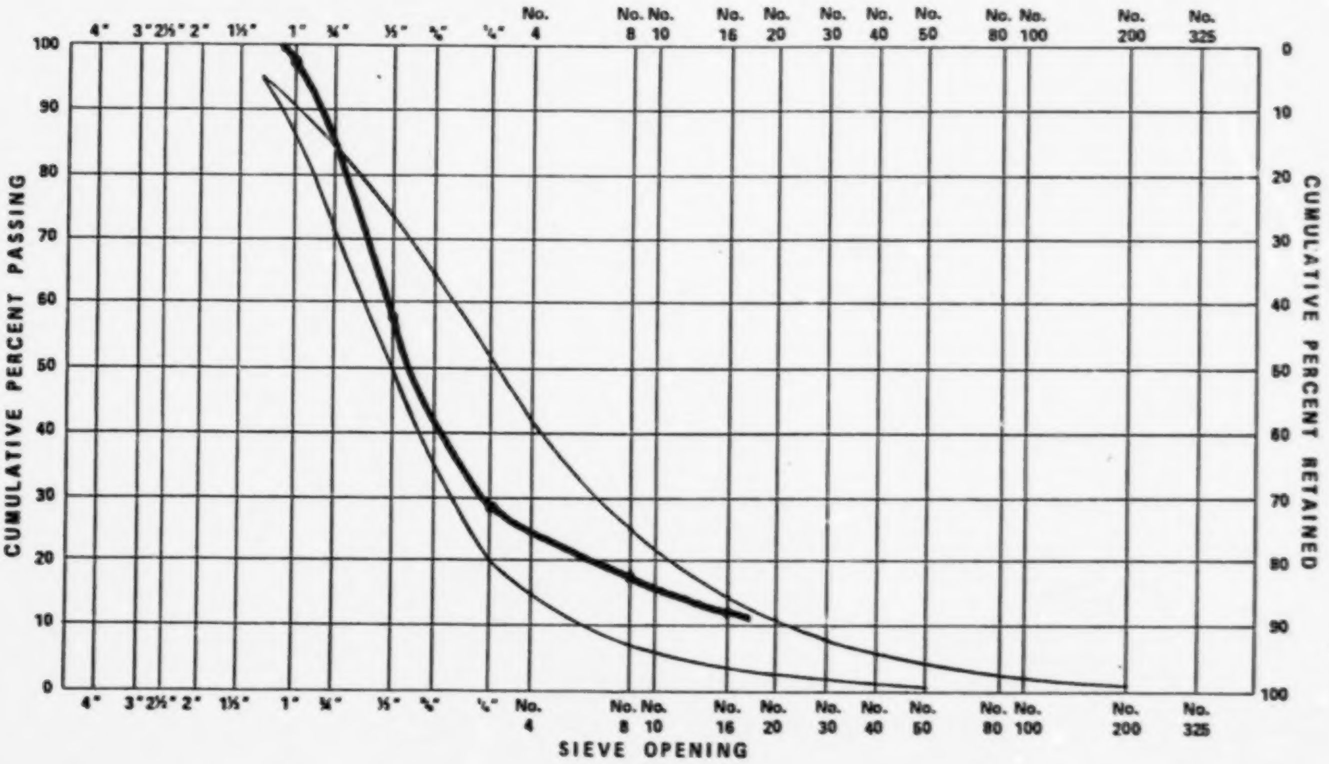
TEST SITE F

TEST PERFORMED BY Tidona

SAMPLE IDENTIFICATION Pa Bit Coal B

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
TOP			196.8	3.0	6480.6	100.0	6
1"			1466.7 1132.1 / 2598.8	40.1	6283.8	97.0	1
½"			1844.8	28.5	3685.0	56.9	2
¼"			749.2	11.6	1840.2	28.4	4
No 8			316.8	4.9	1091.0	16.8	8
No 16			774.2	11.9	774.2	11.9	16

totals = 6480.6 100.0



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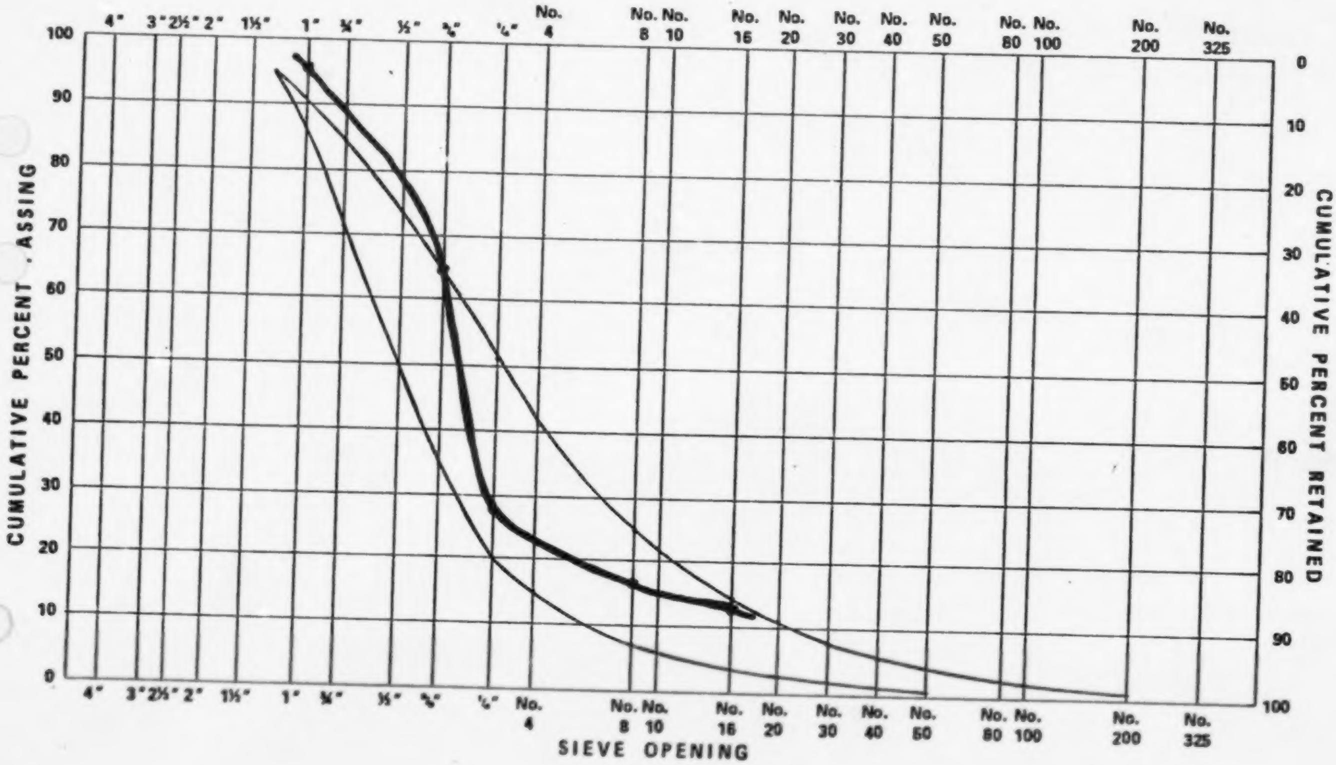
SIEVE ANALYSIS TEST REPORT

TEST NO. 30
TEST SITE F
SAMPLE IDENTIFICATION Pa. Bitum. Coal B
DATE SAMPLE TAKEN 2-13-79
TEST PERFORMED BY Tidora

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			226.1	4.0	5627.3	100.0	0
1"			1768.0	31.4	5401.2	96.0	1
½"			2032.7	36.1	3633.2	64.6	2
¼"			655.2	11.6	1600.5	28.4	4
No. 8			255.1	4.5	945.3	16.8	8
No. 16			690.2	12.3	690.2	12.3	16

Totals = 5627.3 99.9



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SIEVE ANALYSIS TEST REPORT

TEST NO. 35

DATE SAMPLE TAKEN 2-14-79

TEST SITE F

TEST PERFORMED BY T. dona

SAMPLE IDENTIFICATION Pa. Bit. Coal B

Screen Size Passing	Tare Weight (gm)	Gross Weight (gm)	Net Weight (gm)	Percent (%)	Cumulative Weight Passing (gm)	Cumulative Percent Passing (%)	Sieve Shaker Duration (min)
Top			151.2	2.9	5133.1	100.0	0
1"			2064.7	40.2	4981.9	97.1	1
1/2"			1485.7	28.9	2917.2	56.8	2
1/4"			529.0	10.3	1431.5	27.9	4
No. 8			236.8	4.6	902.5	17.6	8
No. 16			665.7	13.0	665.7	13.0	16

Totals = 5133.1 99.9